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SOME STATISTICAL OBSERVATIONS ON TERMITES, MAINLY BASED ON THE WORK OF THE LATE MR G. D. HAVILAND.

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(1) IN the year 1906 Mr A. E. Haviland of Estcourt, Natal, kindly placed at my disposal the collections and notes of the late Mr G. D. Haviland. The latter had made a special study of the termites of Natal and of the Malay Archipelago, and he published a valuable paper on these insects in the *Linnean Society's Journal*, Vol. XXVI. p. 358 *et seq.*, 1897. The notes include some interesting observations on the life-histories of the Natal species of termites, and also a large series of measurements made on one particular species, *Termes natalensis Haviland*. The general biological observations, which appear to be unrecorded, are being incorporated in a short paper which is about to be published in the *Annals of the Natal Government Museum*, while in the present paper the measurements will be briefly dealt with. For the elucidation of some doubtful points, Mr Haviland's observations have been supplemented by some fresh measurements on *Termes natalensis* and also on other species.

As is well known, termites are social insects with an economy bearing some resemblance to that of ants and social bees and wasps. The nature of the inhabitants of a termite-nest varies according to the species and to the season of the year at which examination is made. If a nest of *T. natalensis* be examined in the spring (September) the following different castes may be found: (1) a single *queen* and a single *king*, these are the only sexually mature forms that occur; (2) *soldiers* of two sizes, asexual; (3) *workers* of two sizes, asexual; (4) *winged males* and *females*, not sexually mature; (5) *young or immature members* of castes (2), (3) and (4).

In some species there are several queens and kings in the nest, and the soldiers and workers may be of one size only, or the soldiers may be absent altogether.

In ants and bees the workers (and soldiers, when they occur) are sterile females; while in the termites it appears that both the soldiers and workers are abortive individuals of either sex. There is also evidence for believing that the ultimate

fate of the young on hatching is not predetermined, but depends on the subsequent treatment they receive at the hands of the workers. According to this view any given individual on hatching from the eggs may, in the case of *T. natalensis* for example, develop into any one of five distinct forms or castes, which in no way grade into one another, viz. two forms of soldiers, two forms of workers and the winged sexual form. It is certainly most difficult to form a conception on any theory of heredity as to the means by which hereditary characters could be inherited by such a plastic and modifiable organism as the newly hatched young of a termite.

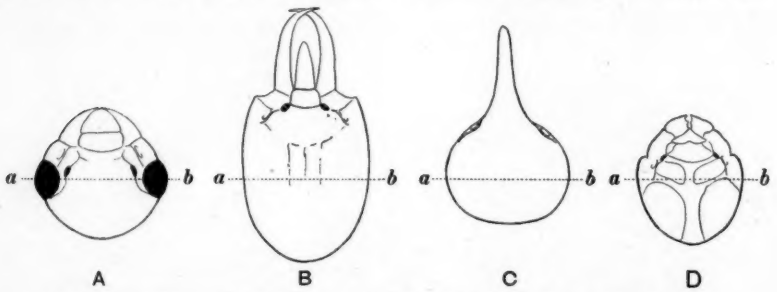
After the first rains the winged sexual forms swarm out of the nest and copulate in the air; they seldom or never appear to return to the parent nest. A pair may succeed in founding a new nest, and will ultimately become the queen and king.

The nest of *T. natalensis* is slow in growing, and it remains inhabited for many years. The same queen and king undoubtedly live for a number of years, and in some species (including *T. natalensis*) it is not known how they are replaced, should they die or an accident befall them.

(2) *The Measurements.*

The measurements were made only on what appeared to be *adult* members of the different castes, except in the case of the winged imagos, when on one occasion nymphs with wing-rudiments were measured. An individual was regarded as *adult* when the exoskeleton of the head was firm and had assumed the characteristic yellow or brown colour. This point is, of course, of considerable importance as there is no sharply marked metamorphosis among termites.

In any case, whether of soldiers, workers or winged imagos, the same dimension was chosen for measurement, viz. the maximum breadth of the head (*ab* in figure below). Owing to the varying configuration of the head in the different castes and species, this dimension in certain cases passes through the compound lateral eyes;



Heads of various castes, viewed from above, showing the line of measurement (*a b*).

A. Imago, *Termes natalensis*. B. Small Soldier, *Termes natalensis*.
C. Large Soldier, *Termes trinervius*. D. Worker, *Termes trinervius*.

and when such occurs it was found that the measurement could be more conveniently and accurately taken if the breadths of the eyes were included in the dimension. It is certain that the inclusion of the eyes in such cases has no appreciable effect on the results, as the correlation of the size of head and eyes is exceedingly close; and the eyes being partially sunk in the exoskeleton complete the contour of the head. It should be noticed that the dimensions taken of the different castes are not perfectly homologous, for some soldiers are blind and others have curiously shaped heads; but they are as nearly homologous as the nature of the case admits, and they may all be regarded as closely comparable measurements.

The measurement of the selected dimension may be made with sufficient accuracy on account of the comparatively rigid nature of the exoskeleton of the head. Length or breadth measurements of the abdomen would have been quite unreliable.

The specimens were in all cases preserved in alcohol.

The method of measurement adopted by Mr Haviland is not recorded in his notes; but I have no hesitation in accepting his data as thoroughly trustworthy. The method which I found most satisfactory was to examine the specimen under an 'aa' or 'AA' Zeiss objective with a camera lucida, and to mark off the dimension on a slip of paper. The termite was flooded with spirit on a slide, and orientated by means of a small piece of glass placed above it. The slip of paper was referred to a scale made with the camera from a stage-micrometer (divided into $\frac{1}{10}$ and $\frac{1}{100}$ mm.) viewed under the same magnification, and the absolute dimension could thus be read off. One or two small series measured by Mr Haviland were re-measured by my method and the results were in close accord.

The measurements of *Termes natalensis* will be first dealt with, and subsequently a comparative review of some of the Natal species of termites will be made.

(3) *Termes natalensis Haviland.*

As we have already seen a colony of this species consists of one queen and king, numerous soldiers of two sizes and workers of two sizes, also immature young or larvæ, and at certain seasons nymphs of males and females, which on becoming winged leave the nest as a swarm.

In the accompanying table the means, standard deviations and coefficients of variation $\left(\frac{\text{Standard Deviation}}{\text{Mean}} \times 100\right)$ of a considerable number of different colonies are shown. The measurements refer chiefly to the soldiers and the workers: where the material was available the queen and king were measured, and in nest No. "653" one hundred male and one hundred female nymphs with wing-rudiments were measured (see Table VIII.).

The nests are arranged in the table according to the season of the year at which the material was collected, beginning with November.

TABLE I.

Termes Natalensis.

Unit=0·01 mm.

Date of Collection	No. of Nest	Royalty		Large Soldiers				Small Soldiers				Large Workers				Small Workers			
		Queen	King	No.	Mean	S. D.	C. of V.	No.	Mean	S. D.	C. of V.	No.	Mean	S. D.	C. of V.	No.	Mean	S. D.	C. of V.
Nov. 7	668	—	—	—	—	—	—	100	227·3	10·20	4·49	86	214·2	5·99	2·79	—	—	—	—
Jan. 18		—	—	3	456·3	—	—	100	233·2	7·61	3·26	85	213·9	7·22	3·37	10	143·4	—	—
Mar. 16		—	—	—	—	—	—	100	237·5	7·40	3·12	89	222·5	4·79	2·15	—	—	—	—
May 16		—	—	3	425·0	—	—	100	237·3	6·91	2·91	100	235·2	7·59	3·23	54	156·7	6·93	4·42
Aug. 23		—	—	—	—	—	—	100	231·8	8·23	3·55	100	226·9	4·66	2·06	—	—	—	—
Nov. 11	670	—	—	4	428·0	—	—	100	247·9	7·05	2·84	100	231·5	7·44	3·22	45	160·3	4·41	2·75
Jan. 18		—	—	46	422·4	13·98	3·31	200	260·3	7·11	2·73	100	246·3	6·07	2·46	—	—	—	—
Mar. 16		—	—	7	441·1	—	—	200	261·3	6·07	2·32	72	248·5	5·45	2·19	—	—	—	—
May 17		—	—	1	434·0	—	—	100	255·7	6·94	2·71	100	247·7	7·02	2·83	14	161·6	—	—
Aug. 25		—	—	5	437·8	—	—	100	237·7	9·23	3·88	100	233·4	6·40	2·74	43	155·4	3·50	2·25
Nov. 12	672	—	—	14	410·6	—	—	100	240·4	13·28	5·52	100	235·9	10·13	4·29	—	—	—	—
Jan. 12		—	—	12	412·0	—	—	100	245·7	7·89	3·21	100	234·4	5·10	2·18	—	—	—	—
Mar. 17		—	—	15	413·7	—	—	100	245·2	6·32	2·58	100	239·4	4·68	1·96	100	157·9	3·62	2·29
May 18		—	—	23	412·0	9·89	2·40	100	239·6	8·78	3·66	100	236·4	5·78	2·44	76	154·6	3·28	2·12
Aug. 28		—	—	8	409·7	—	—	100	227·9	8·48	3·72	100	226·9	5·09	2·24	—	—	—	—
Nov. 16	674	—	—	7	424·6	—	—	100	244·7	7·09	2·90	92	234·9	5·73	2·44	4	158·0	—	—
Jan. 18		—	—	3	421·5	—	—	100	238·8	7·28	3·05	100	230·0	5·82	2·53	4	152·3	—	—
Mar. 17		—	—	10	417·0	—	—	100	251·5	7·08	2·82	100	243·6	4·64	1·91	57	158·2	3·59	2·27
May 20		—	—	—	—	—	—	100	244·5	6·93	2·83	100	242·3	4·93	2·03	38	154·1	2·70	1·75
Aug. 29		—	—	—	—	—	—	100	231·2	7·47	3·23	100	230·2	6·33	2·75	27	150·4	3·02	2·01
Nov. 16	675	—	—	19	419·1	—	—	197	245·6	7·40	3·01	100	236·0	5·65	2·39	68	161·0	4·78	2·97
Jan. 18		—	—	22	415·0	—	—	100	262·6	7·02	2·67	100	247·8	5·96	2·40	5	162·2	—	—
Mar. 17		—	—	7	417·6	—	—	100	263·3	5·94	2·26	100	253·9	4·64	1·83	25	167·9	3·92	2·33
May 29		—	—	3	438·6	—	—	98	248·7	6·94	2·91	100	246·1	5·30	2·15	22	155·3	—	—
Aug. 29		—	—	27	429·0	14·55	3·39	100	241·0	6·88	2·86	100	236·0	7·31	3·10	42	156·4	3·04	1·94

Aug. 20	620	361 ?	—	37	458·8	14·76	3·22	300	270·7	12·57	4·64	600	255·4	9·99	3·91	—	—	—	—
May 23				34	458·2	16·13	3·52	842	271·3	7·24	2·67	33	262·5	5·07	1·93	18	165·8	—	—
Nov. 12	630	—	—	187	423·7	12·94	3·05	1100	239·0	8·36	3·50	200	238·5	5·40	2·26	36	156·4	3·33	2·13
June 3				27	431·1	13·20	3·06	1000	243·8	6·59	2·70	32	248·0	5·12	2·06	4	159·0	—	—
Nov. ...	676	—	—	10	429·0	—	—	100	229·5	6·91	3·01	74	231·9	6·03	2·60	—	—	—	—
Nov. ...	677	—	—	10	421·6	—	—	100	245·4	6·52	2·66	88	240·5	6·85	2·85	9	162·4	—	—
Nov. ...	678	—	—	—	—	—	—	100	241·6	7·21	2·98	80	233·6	5·19	2·22	45	160·0	3·85	2·40
Nov. ...	679	—	—	6	450·2	—	—	100	233·1	7·72	3·31	100	232·4	4·46	1·92	—	—	—	—
Apr. ...	617	361	absent	219	456·1	12·83	2·81	1600	277·3	7·35	2·65	268	270·9	5·05	1·87	—	—	—	—
May 23	620	361 ?	—	34	458·2	16·13	3·52	842	271·3	7·24	2·67	33	262·5	5·07	1·93	18	165·8	—	—
May 16	668	—	—	3	425·0	—	—	100	237·3	6·90	2·91	100	235·2	7 59	3·23	54	156·7	6·93	4·42
May 17	670	—	—	—	—	—	—	100	255·7	6·94	2·71	100	247·7	7·02	2·83	14	161·6	—	—
May 18	672	—	—	23	412·0	9·89	2·40	100	239·6	8·78	3·66	100	236·4	5·78	2·45	76	154·6	3·28	2·12
May 28	674	—	—	—	—	—	—	100	244·5	6·93	2·83	100	242·3	4·93	2·03	38	154·1	2·70	1·75
May 29	675	—	—	3	438·6	—	—	98	248·7	6·94	2·91	100	246·1	5·30	2·15	22	155·3	—	—
June 3	630	—	—	27	431·1	13·20	3·06	1000	243·8	6·58	2·70	32	248·0	5·12	2·06	4	159·0	—	—
June ...	634	—	—	100	408·5	10·45	2·56	100	233·3	7·76	3·33	—	—	—	—	—	—	—	—
June ...	637	368	362	30	429·2	12·02	2·80	200	247·8	6·50	2·62	36	247·8	6·97	2·81	65	160·4	4·01	2·50
June 20	641	—	—	34	424·7	10·31	2·43	200	242·8	5·92	2·44	49	249·1	5·23	2·10	2	161·0	—	—
June 22	643	—	—	46	424·4	11·78	2·78	100	245·0	6·30	2·57	—	—	—	—	—	—	—	—
June 28	648	—	—	94	453·2	12·72	2·81	100	266·8	7·39	2·77	—	—	—	—	—	—	—	—
June ...	649	—	—	26	450·5	11·83	2·63	300	255·0	6·94	2·72	86	249·6	7·36	2·95	34	158·9	5·12	3·22
June 28	651	352	362	88	445·9	13·18	2·96	200	262·8	7·18	2·73	63	256·9	4·45	1·73	—	—	—	—
June 30	652	373	361	55	469·6	22·64	4·82	200	280·2	9·32	3·33	57	271·6	4·70	1·73	3	169·7	—	—
June ...	653	369	350	213	456·1	15·31	3·36	1100	267·7	9·50	3·55	1100	262·7	8·41	3·20	1100	168·5	5·35	3·18
Aug. 9	654	354	356	38	430·8	16·72	3·88	500	229·5	6·92	3·02	200	230·7	5·88	2·55	35	150·0	3·44	2·29
Aug. 25	657	367	350	34	434·2	12·61	2·90	100	221·7	9·36	4·22	100	233·7	8·87	3·80	47	149·0	3·10	2·08
Sept. 20	658	363	369	8	445·2	—	—	500	235·1	6·54	2·78	500	235·1	6·10	2·60	14	154·4	—	—
Sept. 23	660	366	356	55	438·1	10·98	2·51	200	231·7	13·33	5·72	100	227·6	7·36	3·24	15	155·4	—	—
Sept. 26	661	—	—	22	420·5	—	—	100	227·6	6·37	2·80	100	224·9	5·13	2·28	16	151·5	—	—
Sept. ...	662	—	—	92	413·8	13·92	3·36	100	225·8	5·74	2·54	100	227·5	6·32	2·78	100	154·5	3·01	1·95
Oct. 4	665	362	—	179	418·3	16·66	3·98	100	241·6	7·46	3·09	100	234·9	5·38	2·29	100	159·1	5·51	3·47
Oct. 5	666	366	348	84	421·4	14·11	3·35	100	232·4	6·23	2·68	100	232·6	5·39	2·32	100	156·6	3·72	2·38
Oct. 25	667	367	359	88	439·3	15·46	3·55	300	235·5	6·47	2·75	100	227·4	4·38	1·93	12	154·5	—	—

[Probable errors of means about ·7 and of standard deviations about ·5 for 100 cases. ED.]

(4) *Seasonal Variation.*

Material obtained from the *same* nest at different months exhibited variation in the means and standard deviations. In the first part of Table I. are given the records of seven nests from which material had been collected at different seasons, generally Nov., Jan., Mar., May and August. A comparison of the figures will show that as a rule the mean was lowest and the standard deviation greatest when the material was taken in November, while generally the mean was highest and the standard deviation smallest in the month of March.

In the following table (Table II.) are given the arithmetic means of the means, standard deviations and the coefficients of variation of samples (varying from 72 to 200 in number) of small soldiers and large workers taken from five nests "668," "670," "672," "674," "675" (see Table I.) in the months mentioned above.

TABLE II.

Termes Natalensis.

Month of Collecting	Means of the Five Nests					
	Small Soldiers			Large Workers		
	Mean	Standard Deviation	Coefficient of Variation	Mean	Standard Deviation	Coefficient of Variation
November ...	241·2*	9·00*	3·75	230·5*	6·99*	3·03
January ...	248·1	7·38	2·99	234·5	6·03	2·59
March ...	251·8	6·56	2·62	241·6	4·84	2·01
May ...	245·2	7·30	3·00	241·5	6·12	2·54
August ...	233·9	8·06	3·45	230·7	5·96	2·58

* Unit = ·01 mm.

This seasonal variation probably arises from two causes at least; (1) the elimination of the physically unfit, (2) post "adult" growth. With reference to the first cause it may be noticed that it is very probable that more individuals arrive at maturity from August to November, that is during the first rains, than at other seasons, and therefore the stunted adults will be more abundant during this period, with the result that the mean would be lowered and the standard deviation would be raised. By the time that March arrives the small and weakly individuals of the nest are likely to have died, and consequently the mean will be raised and the standard deviation will be diminished. The second, and perhaps more potent influence, is that the so-called "adults" appear to grow to a certain extent even after their exoskeleton has become hard and yellow. In the following table (Table III.) the frequencies for six nests are given for small soldiers and large workers mostly collected in November and March.

TABLE III.

Termes Natalensis.

Material collected from six nests during November, March and June.

Scale. Unit =0·03 mm.	Small Soldiers												Large Workers											
	630		*668*		*670*		*672*		*674*		*675*		*630*		*668*		*670*		*672*		*674*		*675*	
	Nov.	June	Nov.	Mar.	Nov.	Mar.	Nov.	Mar.	Nov.	Mar.	Nov.	Mar.	Nov.	June	Nov.	Mar.	Nov.	Mar.	Nov.	Mar.	Nov.	Mar.	Nov.	Mar.
197—199	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
200—202	—	—	1	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—
203—205	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—
206—208	—	—	1	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—	—	—
209—211	—	—	3	—	—	—	1	—	—	—	—	—	—	—	19	—	—	—	1	—	—	—	—	—
212—214	—	—	4	—	—	—	2	—	—	—	—	—	—	—	14	2	1	—	0	—	1	—	—	—
215—217	2	—	3	1	—	—	2	—	—	—	—	—	—	—	18	9	0	—	2	—	0	—	—	—
218—220	4	—	6	1	—	—	4	—	—	—	—	—	—	—	14	23	5	—	2	—	1	—	—	—
221—223	21	—	12	1	—	—	5	—	—	—	—	—	—	—	4	20	6	—	8	—	2	—	1	—
224—226	29	3	15	4	1	—	5	—	—	—	1	—	1	—	4	18	10	—	9	1	2	—	4	—
227—229	68	11	8	6	1	—	6	—	1	—	0	—	9	—	1	11	22	—	7	0	7	—	6	—
230—232	115	22	14	12	1	—	4	2	3	—	3	—	15	—	1	2	16	—	9	5	16	1	13	—
233—235	143	75	16	11	2	—	6	3	7	1	10	—	33	—	—	3	13	—	7	11	13	2	25	—
236—238	146	96	7	17	3	—	4	7	6	1	18	—	43	1	—	1	12	—	10	27	26	9	22	—
239—241	168	142	3	19	5	—	8	16	15	7	27	—	42	4	—	—	6	3	14	25	16	22	14	—
242—244	133	209	1	12	14	1	10	20	18	6	32	—	30	3	—	—	5	16	13	18	6	26	5	1
245—247	80	171	1	10	21	0	7	21	15	14	35	—	19	5	—	—	1	17	4	9	2	20	7	6
248—250	81	135	0	2	18	6	8	10	18	19	29	2	5	8	—	—	1	15	8	3	—	13	3	20
251—253	45	69	1	2	16	13	11	12	6	13	13	4	1	7	—	—	1	7	2	0	—	6	—	18
254—256	37	33	1	1	8	24	9	4	5	16	15	6	2	3	—	—	0	7	3	1	—	0	—	26
257—259	19	20	1	1	7	31	3	3	3	9	5	17	—	1	—	—	1	5	0	—	—	1	—	18
260—262	6	9	—	—	0	38	3	1	2	8	4	11	—	—	—	—	—	1	1	—	—	—	—	8
263—265	1	4	—	—	2	40	1	1	1	3	3	23	—	—	—	—	—	0	—	—	—	—	—	2
266—268	2	1	—	—	1	22	1	—	—	2	1	20	—	—	—	—	—	1	—	—	—	—	—	1
269—271	—	—	—	—	—	16	—	—	—	1	1	9	—	—	—	—	—	—	—	—	—	—	—	—
272—274	—	—	—	—	—	7	—	—	—	—	—	6	—	—	—	—	—	—	—	—	—	—	—	—
275—277	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
278—280	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Totals	1100	1000	100	100	100	200	100	100	100	100	197	100	200	32	86	89	100	72	100	100	92	100	100	100

A careful comparison of these frequencies will, I think, lead to the opinion that both of the suggested causes have a share in producing the seasonal variation. The apparent elimination of the small and unfit is best shown in nests "630" and "672" for both the small soldiers and large workers.

(5) *Ratios and Variation of the different Castes.*

Having thus noted the presence of a seasonal variability in a single nest, we may pass to the variability exhibited by a series of colonies. It would, of course, have been preferable to have avoided the disturbing element of the seasonal variation by collecting all material at one season of the year; but this was not done as the presence of a seasonal variation was not suspected.

In the following table (Table IV.) are given the arithmetical means of the means, standard deviations and coefficients of variation of the four castes in a number of nests (see Table I.).

TABLE IV. *Means.*

Caste	Number of Nests*	Mean	Number of Nests †	Standard Deviation	Coefficient of Variation
Large Soldiers ...	23	434·01‡	20	13·64‡	3·12
Small Soldiers ...	30	245·00	30	7·37	3·02
Large Workers ...	27	242·21	27	5·94	2·46
Small Workers ...	19	156·90	12	4·17	2·65
Male Nymphs ...	1	300·05	1	4·71	1·57

There is no overlapping of the large soldiers and small soldiers or of the large workers and small workers; in other words, there was never any question whether any individual should be classed amongst the "large" or "small" series.

With reference to the particular dimension measured there is overlapping between the small soldiers and large workers; but the soldiers and workers are totally distinct in general structure and shape.

Ratios.

$$\frac{\text{Mean of Small Soldiers}}{\text{Mean of Large Soldiers}} \times 100 = \frac{245{\cdot}001}{434{\cdot}013} \times 100 = 56{\cdot}4,$$

and

$$\frac{\text{Mean of Small Workers}}{\text{Mean of Large Workers}} \times 100 = \frac{156{\cdot}901}{242{\cdot}206} \times 100 = 64{\cdot}8.$$

Thus, in the proportion in size that occurs between the "large" and "small" classes, the soldiers and workers approach each other; the "small" class being more than half the size of the "large" class.

$$\frac{\text{Mean of Large Workers}}{\text{Mean of Large Soldiers}} \times 100 = \frac{242{\cdot}206}{434{\cdot}013} \times 100 = 55{\cdot}8,$$

and

$$\frac{\text{Mean of Small Workers}}{\text{Mean of Small Soldiers}} \times 100 = \frac{156{\cdot}901}{245{\cdot}001} \times 100 = 64{\cdot}0.$$

* Nests from which less than 10 individuals were available are here excluded.

† Only nests from which more than 23 individuals were available are included.

‡ Unit = 0·01 mm.

Thus it will be seen that the workers are more than double the size of the soldiers of the similarly sized class.

The variability of the soldiers, as measured by the coefficient of variation, is greater than that of the workers, the ratios being:

$$\frac{\text{Coefficient of Large Workers}}{\text{Coefficient of Large Soldiers}} \times 100 = \frac{2{\cdot}461}{3{\cdot}123} \times 100 = 78{\cdot}8,$$

$$\frac{\text{Coefficient of Small Workers}}{\text{Coefficient of Small Soldiers}} \times 100 = \frac{2{\cdot}647}{3{\cdot}022} \times 100 = 87{\cdot}6,$$

that is the workers are about 0·8 times as variable as the soldiers.

(6) *General Variability of the sexual and asexual Castes.*

The average coefficient of variation for the four castes is 2·8: it is thus seen that the general variability of these termite-castes is distinctly small. The nymphs of the winged sexual forms appear to exhibit extraordinarily little variation. In the case of 100 male and 100 female nymphs (Table VIII. nest "653") the coefficients were only 1·57 and 1·60 respectively. Unfortunately there is no available material for ascertaining the variability of the adult sexual form before leaving the nest in the species *natalensis*; but, as will be seen later, small series of winged imagos have been measured in some of the other species, and there is a general tendency towards a low variability.

It has been remarked that there appears to be good evidence for supposing that the young which hatch from the eggs are all alike, and that by special feeding, or by some manipulation by the workers, any one of the five castes may be produced. From this it would be expected that the variability exhibited by all the castes would be about the same; but it has been shown above that the workers are less variable than the soldiers, and that the asexual castes generally are much less variable than the sexual castes. In this connexion, it should be remembered that the individuals in a nest are all produced from one queen and king. The difference in the variability of the castes must therefore be referred to differences in food or other environmental conditions, since they all have a common parentage, and are presumably all alike on hatching.

Thus, the tendency to vary is induced or modified by the special food or manipulation received, and the influences necessary for the production of a soldier or worker lead to greater variability than those for the formation of a sexual imago. It appears that either sex may be converted into either soldiers or workers, the potential sex having no effect on the ultimate destiny of the individual. It is clear that the environment has an overwhelming effect on these organisms, it influences the variability and decides on the bodily shape and structure of the developing insect.

(7) *Comparison of the Constants of a Family with those of the Population.*

Of small soldiers, random samples from 30 nests were measured. The sizes of the samples were most disproportionate, ranging from 100 to 1600. On adding

TABLE V.

Termes Natalensis Haviland, Small Soldiers; 30 *nests,* 100 *from each.*

No. of Nest	617	634	637	641	643	648	649	651	652	653	620	654	657	658	660	661	662	665	666	667	630	668	670	672	674	675	676	677	678	679	Totals	
Month	April	June	June	June	June	June	June	June	June	July	Aug.	Aug.	Aug.	Sept.	Sept.	Sept.	Sept.	Oct.	Oct.	Oct.	Nov.	Nov.	Nov.	Nov.	Nov.	Nov.	Nov.	Nov.	Nov.	Nov.		
*197—199**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	2
200—202	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	
203—205	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4	7
206—208	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3	
209—211	—	—	—	—	—	—	—	—	—	—	—	—	7	—	—	1	—	—	—	—	—	3	—	1	—	—	—	—	—	—	12	30
212—214	—	—	—	—	—	—	—	—	—	—	—	—	9	—	1	0	1	—	—	—	—	4	—	2	—	—	—	—	—	1	18	
215—217	—	1	—	—	—	—	—	—	—	—	—	3	13	—	4	3	7	—	—	—	—	3	—	2	—	—	4	—	—	0	40	121
218—220	—	4	—	—	—	—	—	—	—	—	-	5	16	1	8	10	12	—	3	2	1	6	—	4	—	—	5	—	—	4	81	
221—223	—	8	—	—	—	—	—	—	—	—	—	11	11	2	8	14	15	—	3	7	3	12	—	5	—	—	6	1	1	5	112	289
224—226	—	9	—	1	—	—	—	—	—	—	—	29	13	8	19	18	18	—	8	7	3	15	1	5	—	—	11	1	1	10	177	
227—229	—	9	—	1	1	—	1	—	—	—	1	15	10	15	21	13	21	4	22	7	4	8	1	6	1	—	13	2	1	10	187	396
230—232	—	12	2	2	2	—	0	—	—	—	1	19	3	16	5	16	12	6	21	16	9	14	1	4	3	1	20	3	5	16	209	
233—235	—	18	4	5	2	—	1	—	—	—	4	10	7	18	8	13	10	14	13	18	18	16	2	6	7	6	16	7	12	20	255	458
236—238	—	14	2	8	6	—	5	—	—	—	6	3	1	22	3	8	3	13	10	14	10	7	3	4	6	9	13	9	13	11	203	
239—241	—	9	7	27	16	—	3	—	—	—	13	2	2	10	1	4	1	12	11	10	15	3	5	8	15	11	7	12	17	10	231	464
242—244	—	6	14	15	24	—	7	1	—	—	7	1	2	5	1	—	—	19	6	10	13	1	14	10	18	18	3	17	13	8	233	
245—247	—	8	16	20	16	—	5	1	—	1	11	0	0	2	2	—	—	9	3	6	6	1	21	7	15	19	0	21	22	3	215	385
248—250	—	2	20	12	12	1	6	4	—	2	7	0	0	1	3	—	—	13	—	2	7	0	18	8	18	11	1	14	7	1	170	
251—253	—	—	13	3	13	1	14	9	—	3	4	0	0	—	4	—	—	4	—	0	1	1	16	11	6	7	1	9	2	0	122	248
254—256	—	—	12	5	5	10	17	8	2	5	8	0	0	—	6	—	—	3	—	1	5	1	8	9	5	9	—	3	4	0	126	
257—259	—	—	6	1	2	6	8	15	2	7	5	0	0	—	2	—	—	1	—	—	3	1	7	3	3	3	—	0	0	0	75	145
260—262	—	—	2	—	1	11	18	8	2	10	7	0	1	—	1	—	—	1	—	—	0	—	0	3	2	2	—	1	0	0	70	
263—265	—	—	2	—	—	12	4	25	2	18	6	1	—	—	2	—	—	1	—	—	1	—	2	1	1	3	—	—	2	1	84	136
266—268	2	—	—	—	—	14	7	7	5	9	5	0	—	—	0	—	—	—	—	—	1	—	1	1	—	0	—	—	—	—	52	
269—271	14	—	—	—	—	15	1	8	8	12	4	1	—	—	0	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	64	144
272—274	19	—	—	—	—	17	2	8	10	17	6	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	80	
275—277	9	—	—	—	—	9	1	2	3	6	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35	81
278—280	21	—	—	—	—	3	—	3	13	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	46	
281—283	15	—	—	—	—	0	—	1	14	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32	51
284—286	6	—	—	—	—	0	—	—	13	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19	
287—289	8	—	—	—	—	0	—	—	10	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19	28
290—292	1	—	—	—	—	1	—	—	7	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9	
293—295	3	—	—	—	—	—	—	—	4	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	13
296—298	2	—	—	—	—	—	—	—	4	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	
299—301	—	—	—	—	—	—	—	—	0	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	
302—304	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	
305—307	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1

* Unit = 0·03 mm.

all together there is obtained a population of 8497 individuals derived from 30 different nests.

The constants are: Mean 251·8, Standard Deviation 19·86, Coefficient of Variation 7·89.

The distribution of the frequencies is irregular, and the polygon shows a well-marked double peak. The cause of this is chiefly attributable to the great disproportion of the size of the samples, and the consequent undue influence of one or two individual nests. To avoid this disturbing effect, random samples of 100 individuals from each of the 30 nests were taken. In this way there results a population of 3000 (Table V.), and the constants are: Mean 243·5, Standard Deviation 17·08, Coefficient of Variation 7·02. The distribution of the frequencies is much less irregular than in the former case, and the polygon is consequently much smoother.

The coefficient of variation of the population of 3000 is thus 7·02 as compared with the mean value of 3·02 for the families. In other words the variability of the family of small soldiers is about 43 °/₀ of that for the population. The variability of the population compared with the fraternal variability is much higher than was expected, judging from the value obtained from certain breeding experiments with a moth, *S. clathrata*, conducted several years ago at University College, London. The cause would appear to be attributable to the great effect of the environment on the means and variabilities of the different castes of a nest.

(8) *Correlation of the Means.*

The correlation between the means of the small soldiers and large workers has been determined in the case of the 27 nests entered in Table I. The correlation-surface is shown in the following table. The calculated constants are: mean of means of small soldiers, 244·3 units, standard deviation, 15·29; large workers, 241·4 units and 13·04 respectively.

Correlation coefficient = ·953, probable error ± ·012.

For the calculation of the correlation between the large soldiers and small soldiers only 20 nests were available.

The constants are: Large soldiers, mean of means, 435·5 units, standard deviation, 16·9; small soldiers, 247·3 units and 17·14 respectively.

Coefficient of correlation = ·831, probable error = ± ·046.

Since the probable error is so considerable, there is no reason for supposing that the correlation between the large and small soldiers differs appreciably from that between the small soldiers and the large workers, which we found to be ·953 ± ·012. It may be assumed that the correlation of the means between any two castes is about ·9. It is curious that the correlation between similar castes (large and small soldiers) does not appear to be greater than that between dissimilar castes (small soldiers and large workers).

TABLE VI.

Termes Natalensis Haviland.

Correlation of the Means of Small Soldiers and Large Workers from 27 nests.*

Small Soldiers Unit = 0·04 mm.	4	3	2	1	2	4	3	0	1	2	0	3	27
221—224	—	—	1	—	—	—	—	—	—	—	—	—	1
225—228	2	—	—	—	—	—	—	—	—	—	—	—	2
229—232	1	2	1	—	—	—	—	—	—	—	—	—	4
232—236	1	0	2	—	—	—	—	—	—	—	—	—	3
237—240	—	—	1	1	—	—	—	—	—	—	—	—	2
241—244	—	—	2	0	1	1	1	—	—	—	—	—	5
245—248	—	—	—	—	1	2	—	—	—	—	—	—	3
249—252	—	—	—	—	—	—	—	—	—	—	—	—	0
253—256	—	—	—	—	—	1	1	—	—	—	—	—	2
257—260	—	—	—	—	—	—	—	—	—	—	—	—	0
261—264	—	—	—	—	—	—	—	—	1	—	—	—	1
265—268	—	—	—	—	—	—	—	—	—	1	—	—	1
269—272	—	—	—	—	—	—	—	—	—	1	—	—	1
273—276	—	—	—	—	—	—	—	—	—	—	—	—	0
277—280	—	—	—	—	—	—	—	—	—	—	—	2	2
Large Workers Unit = 0·04 mm.	*224—227*	*228—231*	*232—235*	*236—239*	*240—243*	*244—247*	*248—251*	*252—255*	*256—259*	*260—263*	*264—267*	*268—271*	

(9) *Standard Deviation of the Means.*

The standard deviation of the means of the large soldiers for random samples taken from 20 nests is 16·90, for small soldiers from 27 nests 15·29, and for large workers from 27 nests, 13·04. It is thus seen that the means of different nests vary very considerably, and reference to Table I. will show that this variation is not entirely or even mainly due to the fact that the material was not all collected at the same time of the year. We have here to do with the effect of inheritance, or with that of the slightly different environment of each nest. It will be noticed that the standard deviations of the means for the three castes are all of the same order of magnitude, although that for the large workers is the lowest.

(10) *Correlation of the Coefficients of Variation.*

The variability of the members of a nest varies in different nests; thus the standard deviation of the coefficients of variation of random samples of small soldiers taken from 27 nests is 4·42 units, and of large workers 3·40 units. The coefficient of correlation between the coefficients of variation of small soldiers and large workers in 27 nests is ·453; but the probable error is ± ·103, which is so great that it is scarcely safe to conclude that we have this correlation very closely.

* The smallest number of individuals from a nest was 32.

TABLE VII.

Termes Natalensis Haviland.

Correlation of the Coefficients of Variation of Small Soldiers and Large Workers from 27 nests.

Small Soldiers Unit = 0·15	3	3	4	4	1	3	0	4	1	2	1	0	0	1	27
244—258	—	—	1	—	—	—	—	1	—	—	—	—	—	—	2
259—273	2	1	1	1	0	0	0	3	1	—	—	—	—	—	9
274—288	—	1	1	1	0	1	—	—	—	—	—	—	—	—	4
289—303	—	—	1	1	0	2	0	0	0	1	—	—	—	—	5
304—318	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
319—333	1	1	—	—	—	—	—	—	—	—	—	—	—	—	2
334—348	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
349—363	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
364—378	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
379—393	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
394—408	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
409—423	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
564—578	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
Large Workers Unit = 0·15	*173—187*	*188—202*	*203—217*	*218—232*	*233—247*	*248—262*	*263—277*	*278—292*	*293—307*	*308—322*	*323—337*	*338—352*	*353—367*	*368—382*	

A correlation table of the coefficients of variation of large soldiers and small soldiers was prepared; but without actual calculation it was obvious that there was practically no correlation present.

From this we gather that in any given nest when one caste happens, say, to be particularly variable, it does not follow that every other caste is correspondingly variable. From *à priori* reasons one would have expected that the variability of the different castes in a nest would have been closely related, if the variability is to be regarded as an inherited character. If, on the other hand, the variability is to be mainly referred to nurture or to the general environmental conditions, the above results are intelligible.

(11) *Comparison of various Species.*

In Table VIII. are given the means, standard deviations and the coefficients of variation of the different castes for all the more commonly occurring Natal termites.

TABLE VIII. *Constants of a Series*

Name of Species	No. of Nest	Locality and Date	Large Soldiers				Small Soldiers			
			No.	Mean	Standard Deviation	Coefficient of Variation	No.	Mean	Standard Deviation	Coefficient of Variation
Hodotermes havilandi, Sharpe	635	Natal, Altitude 3000 ft. June 26, 1898	51	421·4	24·46	5·80	None found			
	636	Natal, Altitude 3000 ft. June 27, 1898	—	—	—	—				
	—	Hlabisa, Zululand, June 25, 1903	—	—	—	—				
Calotermes durbanensis, Haviland	601 & 602	Durban, Feb. 15, 1898	80	178·3	4·45	2·49	None occur			
	608	Durban, Feb. 15, 1898	—	—	—	—				
Termes natalensis, Haviland	653	Natal, Altitude 3500 ft. July 1898	213	456·6	15·31	3·36	1100	267·7	9·50	3·55
Termes badius, Haviland	626	Natal, 1894	124	288·75	10·26	3·55	—	—	—	—
	625	Natal, 1894	—	—	—	—	7	229·0	—	—
Termes latericius, Haviland	647	Slievrye, Estcourt, Natal, June 25, 1898	500	137·4	3·86	2·81	None occur			
Termes vulgaris, Haviland	624	Natal, Altitude 4000 ft. May 28, 1898	500	156·2	3·97	2·55	None occur			
	628	Natal, Altitude 4000 ft. June 1, 1898	—	—	—	—				
Termes incertus, Hagen	629	Natal, Altitude 4000 ft. June 1, 1898	47	76·2	2·25	2·95	None occur			
	Taken from one nest	Natal	—	—	—	—				
Termes parvus, Haviland	633	Natal, Altitude 3600 ft. June, 1898	25	83·4	2·62	3·14	None occur			
	Swarm	Slievrye, Estcourt, Natal, March 30, 1899	—	—	—	—				
	644	Natal, Altitude 3800 ft. June 23, 1898	50	82·7	2·12	2·56				
Termes bilobatus, Haviland	621	Natal, Altitude 3500 ft. May 26, 1898	57	148·1	2·81	1·90	None occur			
	623	Natal, Altitude 3500 ft. May 26, 1898	21	151·8	—	—				
	632	Natal, Altitude 3600 ft. June 15, 1898	25	147·5	2·60	1·76				
	Swarm	Natal, Oct. 24, 1898 ...	—	—	—	—				
	639	Natal, Altitude 3500 ft. June 17	20	148·8	—	—				
	640	Natal, Altitude 3500 ft. June 18	27	147·5	2·74	1·86				
	—	Natal, 1894	—	—	—	—				
	615	Natal, Altitude 5500 ft. April 5	—	—	—	—				
Termes trinervius, Rambur	—	Town Bush, Pietermaritzburg, April 20, 1907	64	142·3	6·23	4·38	70	89·8	3·58	3·99
	Taken from one nest	Natal, Oct. 19, 1898 ...	—	—	—	—	—	—	—	—
	—	Park, Maritzburg, Sept. 15, 1908	—	—	—	—	—	—	—	—
Rhinotermes Sp.	603	Durban, Feb. 1898	93	187·5	6·06	3·23	91	92·04	3·23	3·51

of Species. Unit = 0·01 mm.

Large Workers				Small Workers				Males				Females			
No.	Mean	Standard Deviation	Coefficient of Variation	No.	Mean	Standard Deviation	Coefficient of Variation	No.	Mean	Standard Deviation	Coefficient of Variation	No.	Mean	Standard Deviation	Coefficient of Variation
43	360·3	15·45	4·29	50	237·3	14·34	6·05	—	—	—	—	—	—	—	—
50	380·8	13·71	3·60	34	268·9	12·79	4·76	—	—	—	—	—	—	—	—
12	386·2	—	—	16	278·5	—	—	—	—	—	—	—	—	—	—
—	—	—	—	None occur				—	—	—	—	—	—	—	—
50	149·8	7·42	4·95					—	—	—	—	—	—	—	—
								Nymphs with wing-rudiments				Nymphs with wing-rudiments			
1100	262·7	8·41	3·20	1100	168·5	5·35	3·18	100	300·1	4·71	1·57	100	298·4	4·78	1·60
50	187·1	8·16	4·36	50	132·2	5·74	4·34	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
100	177·9	5·68	3·20	51	112·9	4·88	4·32	—	—	—	—	—	—	—	—
55	156·8	4·40	2·81	100	110·5	2·41	2·19	—	—	—	—	—	—	—	—
								Winged imagos				Winged imagos			
—	—	—	—	—	—	—	—	34	261·7	6·16	2·35	33	262·3	6·92	2·64
50	88·2	3·13	3·55	None found				—	—	—	—	—	—	—	—
								Winged imagos				Winged imagos			
—	—	—	—					35	134·2	2·71	2·02	32	135·9	2·93	2·15
28	77·2	3·67	4·76					—	—	—	—	—	—	—	—
				None occur				Winged imagos				Winged imagos			
—	—	—	—					30	113·0	3·09	2·73	25	119·9	1·94	1·62
—	—	—	—					—	—	—	—	—	—	—	—
—	—	—	—					—	—	—	—	—	—	—	—
—	—	—	—					—	—	—	—	—	—	—	—
20	105·1	—	—					—	—	—	—	—	—	—	—
								Winged Imagos				Winged imagos			
—	—	—	—	None occur				50	112·9	1·71	1·52	43	120·4	2·40	1·99
—	—	—	—					—	—	—	—	—	—	—	—
—	—	—	—					—	—	—	—	—	—	—	—
29	95·1	2·28	2·40					—	—	—	—	—	—	—	—
36	94·6	2·83	2·99					—	—	—	—	—	—	—	—
160	166·4	11·42	6·86					—	—	—	—	—	—	—	—
								Winged imagos				Winged imagos			
—	—	—	—	None occur				26	193·8	4·18	2·16	46	192·4	3·69	1·92
100	165·9	7·73	4·66					—	—	—	—	—	—	—	—
36	144·4	7·79	1·93	Stated to occur, but no specimens				—	—	—	—	—	—	—	—

TABLE IX.

Ratios of Means × 100.

Species	Small Soldiers / Large Soldiers	Small Workers / Large Workers	Large Workers / Small Soldiers	Small Workers / Large Soldiers	Small Workers / Small Soldiers	Large Workers / Small Soldiers	Workers / Male Imagos
Hodotermes havilandi ...	—	65·8	85·5	56·3	—	—	—
Calotermes durbanensis	—	—	84·0	—	—	—	—
Termes natalensis ...	58·7	64·2	57·6	37·0	63·0	98·1	—
Termes badius ...	79·3	70·7	64·8	45·8	73·6	81·7	—
Termes latericius ...	—	63·5	129·5	82·2	—	—	—
Termes vulgaris ...	—	70·5	100·4	70·7	—	—	60·0
Termes incertus ...	—	—	115·7	—	—	—	65·7
Termes parvus	—	—	92·6	—	—	—	68·3
Termes bilobatus ...	—	—	64·0	—	—	—	84·0
Termes trinervius ...	63·1	—	116·9	—	—	185·3	85·9
Rhinotermes	49·1	—	77·0	—	—	156·9	—
Means	62·5	66·9	89·8	58·4	68·3	130·5	72·8

Relative Sizes of the various Castes.—Ratios.

Soldiers of two sizes occur in *Termes natalensis, Termes badius, Termes trinervius* and *Rhinotermes sp.*, and the ratios are given in the 2nd column of Table IX. There is considerable variation in the ratios, and the mean is 62·5.

Two sizes of workers occur in five species. It should be noticed that it does not follow that there are two sizes of soldiers when there are two castes of workers and *vice versa*. The ratios are given in the 3rd column of Table IX. It will be seen that they are fairly constant, the mean (66·9) is somewhat similar to that for the soldiers (62·5).

The ratios of large workers to large soldiers are given in the 4th column of the table and they are exceedingly variable, ranging from 57·6 in *Termes natalensis* to 129·5 in *Termes latericius*.

Various other ratios are given in the remaining columns of the table, and there is no marked tendency for constancy in any of them; although the ratio of workers to winged imagos is less variable than the others.

Means of the Coefficients of Variation.

The arithmetic mean of the coefficients for large soldiers for the 11 species (see Table VIII.) is 3·26; for small soldiers (3 species) 3·68; for large workers (11 species) 3·74; for small workers (5 species) 3·89; for male imagos (6 species) 2·06; and for female imagos 1·98.

It is evident from these results that the male and female imagos are considerably less variable than any of the asexual castes. The special manipulation, whether of the nature of specialised food or of any other influence, necessary for the production of these castes, appears to increase the variability.

With regard to the variability of the asexual castes, it will be noticed that the mean results for the series of species are not in accord with those for the species *Termes natalensis*. In this species the soldiers were more variable than the workers, but in the mean values for all the species the reverse is the case.

(12) *Comparison of the termite measurements with those of Wasps.*

Miss Alexandra Wright, Dr Alice Lee and Professor Karl Pearson have recently completed an investigation on the variability of various parts of the wings of worker, drone and queen wasps (*Biometrika*, Vol. v. Part IV. p. 407, 1907). The material employed comprised the individuals from *one* large nest, and it will be of interest to compare as far as possible the results obtained with those from the termites.

In the absolute dimensions the queens, drones and workers of the wasps are in descending order of magnitude with respect to the wing-measurements.

In the case of the termites, the means of the head-breadths of the five species (*T. vulgaris, T. incertus, T. parvus, T. bilobatus* and *T. trinervius*) were for male imagos, 163·15 units; workers, 117·3 and soldiers, 121·3. Thus, although the

dimensions measured are of a different nature, the wasps and termites agree in the sexual forms being the larger.

The absolute variation in the wasps is greater for the workers than for the drones and queens. In the case of the five species of termites, the workers have a mean absolute variation of 4·67 units against 3·51 for the soldiers and 3·57 for the male imagos; that is, a mean of 4·09 for the asexual castes against 3·57 for the sexual form. The general tendency is consequently for the termites and wasps to resemble each other in this matter.

In the relative variabilities (coefficients of variation) the sexual forms (drones and queens) of the wasps are considerably less variable than the workers, the means being: workers, 3·55; drones, 2·60; queens, 1·57.

In the termites the means are, as we have already seen, for: large soldiers, 3·26; small soldiers, 3·68; large workers, 3·74; small workers, 3·89; male imagos, 2·06; female imagos, 1·99.

There is thus a very striking similarity in these results: the mean of the coefficients for drone and queen wasps is 2·08, and for male and female imagos of the termites 2·02.

The asexual wasp caste of workers with a coefficient of 3·55 also compares very closely with the mean of the coefficients of the asexual termite castes, 3·64.

The material at the disposal of the authors of the wasp paper did not permit of the examination of the correlation of the different castes in a number of nests, and consequently a comparison on this point with the termites cannot be instituted *.

(13) *Summary of some of the Results.*

(1) Although the young appear to hatch all alike and in certain species (*T. natalensis*, for example) all are the offspring of one queen and king, yet the various asexual and sexual castes of a nest exhibit marked differences in their variabilities. The differences in the variability cannot therefore be regarded as due to inheritance, but must be supposed to arise mainly through post-embryonic environmental influences.

(2) The sexual caste is much less variable than the asexual castes.

(3) The relative variability (measured by the coefficient of variation) of the population compared with that of a family (the individuals of a nest) appears to be considerably greater than can be accounted for from the ordinary effects of inheritance†, and the cause is almost certainly to be found in the moulding influence of a varying environment on an exceedingly plastic organism.

[* The relative variability of the species and of the members of a nest is now being investigated and the results will shortly be published. Ed.]

[† The reduction in variability for the case of *assortative mating* of a large amount has not yet been worked out. For the termites we have in each generation a brother-sister marriage, or an assortative mating, say of ·5. There is thus only one pair of ancestors in each generation, and the reduction of variability for such a system may quite conceivably be as great as that indicated by the termite measurements, i.e. nest variability 7·37 and general population variability 17·08. Ed.]

(4) The correlation of the means of any two castes in a nest of a population of colonies is of very considerable magnitude, being about ·9. In other words when, for example, the mean of one caste is above the average, then the mean of any other caste in the nest is correspondingly high. Leaving out the effect of inheritance, this correlation could be accounted for by the fact that similar environmental influences would act on all the members of a nest.

(5) The standard deviations of the means of different castes in a population of colonies are considerable; and there is little doubt that the varying environment of each colony is largely responsible for the great fluctuations in the means.

(6) The correlation of the coefficients of variation of any two castes in a population of nests is either moderate or nil, in other words the variability of one caste is in some instances not appreciably correlated with the variability of any other caste in the nest. Owing to the fact that all the castes spring from the same parentage, we might have anticipated that a fairly high correlation would exist. We have therefore evidence that a similar environment can have a varying influence on the variabilities of the different castes.

A comparison of these results with those obtained from other social insects would be of much interest, and would throw additional light on the significance, or otherwise, of some of the observations made in this paper.

NOTE ON THE SKIN-COLOUR OF THE CROSSES BETWEEN NEGRO AND WHITE.

By KARL PEARSON, F.R.S.

Those who feel compelled at present to hold their final judgment with regard to Mendelism in suspense, who do not think the statistical proof of its generality by any means yet complete, and who still question on logical grounds many of the statements made with regard to it, have nevertheless been ready to emphasise the paramount service of Mendel in drawing attention to the great factor of segregation in many inheritance problems. This admission can be made without overlooking the facts—too often disregarded—that segregation is not a universal principle, that it is, where it does occur, often incomplete, and that even where it occurs and is more or less complete it does not necessarily follow the simple Mendelian ratios. The theory of the "pure gamete," the "unit character" and the "allelomorph" may have aided, suggested and controlled much experimental work on inheritance, but this theory has undoubtedly been pushed—chiefly by young and enthusiastic disciples of Mendelism, who thought that at last a formula of heredity requiring no mathematical knowledge had been discovered—far beyond the limits of actual experimental work, or in some cases beyond the inferences allowable from the data actually observed. The public has been dosed by the general Mendelian practitioner with:

$$(DR) \times (DR) = (DD) + 2(DR) + (RR)$$

and told that it solved all difficulties. But the higher consultants know that at the very best many complications arise, that even in segregation transitional forms occur occasionally or even frequently, and that "unit characters" are not independent but often highly correlated. They are also fully conscious that much straining of the theory of probability often is needed to make the ratios fit a simple Mendelian formula. The reason for these prefatory remarks lies in the fact that some time ago it was asserted by an ardent Mendelian that skin colour in crosses between dark and light skinned races would probably be found to obey Mendelian principles. It had been hitherto almost universally accepted that skin colour did

not segregate, but that in a mixed population all tints according to the degree of mixture were to be found. This view of the matter appeared to be that of men who had long resided among mixed races, and had become axiomatic with the West Indies courts of justice when determining cases of doubtful paternity. The rule of a court of justice is generally one of practical experience in human affairs, but of course we cannot in science take it as conclusive evidence of the absence of segregation.

At first sight the question appears to be capable of an easy answer. If L represents a light skin and D a dark skin, we shall term the pure races (LL) and (DD), and the problem turns on whether segregation occurs when we have the mating:

$$(LD) \times (LD).$$

Is the result $(LL) + 2(LD) + (DD)$? Now without any hypothesis as to the nature of the skin of (LD), we ought when mulattos or Eurasians cross among themselves to find 25 p.c. of their offspring at least white skinned, and so readily distinguishable. The problem, however, is not so easily answerable, and for the following reasons:

(*a*) There is a considerable range of variability of pigmentation in the white races, and an equal range of variability in the dark races, which may also be said to have their "blonds" and "brunettes," although what the negroes term a 'fair' negro, would often be called by the European a black.

(*b*) Among the Eurasians in the populous parts of India an inquiry as to parentage is much resented. It is possible to examine the children in the Eurasian schools and often to observe their parents, but the fundamental question as to the parents' parents, the original (LL) and (DD), is generally unanswered.

(*c*) In the West Indies where the race differences are less acute, we are met by the difficulty that 60 p.c. of the children in some islands are born out of wedlock. Many mistakes in paternity are made, and colour as I have indicated is one of the definite factors in deciding this matter in a court of law.

Now I do not pretend to have settled the problem for either Eurasian or mulatto strains, but I have endeavoured to set on foot inquiries in the Eurasian schools in India and among medical men in the West Indies which may some day help to answer the problem. This note only proposes to consider some communications I have had with a correspondent in the West Indies. He is a medical man, who, except for his period of training in London, has spent his whole life in the West Indies and knows its people and their ways very intimately. He has most kindly provided me with a series of photographs illustrating some of the mixed types. It is very hard to indicate the various shades of colour unless all the subjects are taken on precisely the same plate, with the same exposure and the same illumination. I am having further observations made with von Luschan's skin mosaics, but I think the present photographs will suffice to indicate that there is a real gradation in the types.

The questions I put to my medical correspondent were as follows:

(1) Is white × negro a blend or not? Is it correct to say that the mulatto is a blend?

Answer. "To this question there is only *one* answer; it gives a definite well-recognised blend, and a blend which is easily seen and identified by any sensible man who has had any experience. You can infer and state freely, that there is this definite blend. But the colour of the mulatto varies, and practically may be divided into two sections:

(*a*) The brown mulatto, with a colour of light mahogany.

(*b*) The yellow mulatto with the colour of a well cleaned brown boot, which has not been much worn.

But I have never seen any reversion to the white or negro type in a genuine mulatto, and I have come in contact with hundreds of them. The yellow mulatto is comparatively uncommon here; roughly speaking I should say under 15 p.c. of all mulattos."

It will be seen from this result that a new problem is opened up—that of accounting for the difference between the brown and the yellow mulatto. The answer excludes the possibility of dominance in the Mendelian sense from the discussion.

My Figs. (i)—(iii) give pure negro individuals. Fig. (ii) is described as a perfectly black negress and Fig. (i) as a negro "as black as the ace of spades."* Fig. (v) is the photograph of a florid Englishman taken with the same camera as control. Fig. (iv) is a representative of the mulatto type.

The problem of the difference between the brown and yellow mulatto would be a remarkably interesting one to work out, but the difficulty of the inquiry might be great. Is it, perhaps, due to difference of pigmentation in the European parents? Or, to a difference in negroid race? One point, I think, deserves consideration with regard to further inquiry in this field: Does the sex of the white parent make any difference in the colour of the offspring? In searching through literature to find any reference to segregation in the offspring of mixed races, I have come across three cases only, in which the hybrid was directly stated not to be a blend or mulatto. The first case is due to Aristotle† who describes how a woman in Elis bore a *white* daughter to an Aethiopian, but this daughter had a black son by a white father. If the case were really authentic, it would be the rule proved by the exceptions, i.e. a Mendelian dominance of the white, followed by a Mendelian segregation, which nullifies this dominance of the white. The second case is cited by Parsons‡, who says that a white woman married a negro in York and had by him a perfectly negro child. Here we have dominance of the black. The third case is also due to Parsons; he tells how a white woman had a white child by a negro, but its buttock was black, i.e. it was a piebald. There may well be other cases, but I have not come across them. Now on these three cases no stress whatever can be laid, but they suffice to suggest that, whereas in

* In all photography of dark races, the high lights reflected from black surfaces must be allowed for.

† *De generatione Animalium* Lib. I. cap. XVIII.

‡ *Phil. Trans.* Vol. LV. 1765, p. 45.

the bulk of cases the male is a white and the female a black, it would be well to inquire whether a change of sex can produce any differences in the colour of the offspring or in the nature of the dominance.

If we accept that (*LD*) is a blend, we should expect that mulatto × white would give 50 p.c. of whites and 50 p.c. of blends. My next question was put to test this.

(2) Mulatto × white gives a quadroon. Is or is not the quadroon a blend? Theory says that the quadroon class should consist of half whites and half mulattos.

Answer. "With the small exception of the yellow mulattos the quadroon is almost invariably lighter in colour than the brown mulatto, and one is safe in saying that the quadroon is nearly always—say in 90 p.c. of cases—whiter than even the yellow mulatto. *Pure white skins do not occur in quadroons.* This statement is dogmatic and true."

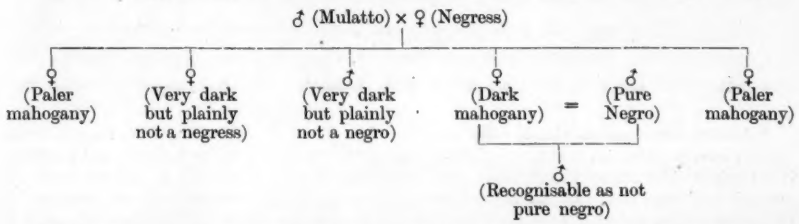
The next question I asked related to the cross (*LD*) × (*DD*).

(3) Mulatto × negro. Is this a blend rather darker than the mulatto or not? Theory would say that 50 p.c. of the offspring were mulattos and 50 p.c. negroes in skin colour.

Answer. "The mulatto × negro crosses produce what is here termed the 'Sambo,' a deep mahogany brown and they produce nothing else. They do not produce mulattos and they do not produce negroes. The Sambo type is very distinct, and there is, as far as my experience goes, no reversion either to the white or black races. I have never seen a single case of reversion to either mulatto or negro."

Fig. (vi) shows a Sambo girl of the rather lighter type. The colour is well shown in the hands (not in photograph) which are of a rich chocolate tint, and could not be mistaken for black. Figs. (vii) and (viii) give a Sambo girl darker than the average type, but no one with experience would mistake this girl for a negress.

The following pedigree is an example of the range found in a Sambo sibship:


♂ (Mulatto) × ♀ (Negress)
♀ (Paler mahogany)
♀ (Very dark but plainly not a negress)
♂ (Very dark but plainly not a negro)
♀ (Dark mahogany)
=
♂ (Pure Negro)
♀ (Paler mahogany)
♂ (Recognisable as not pure negro)

The colour range here is from something rather darker than the mulatto to something rather less dark than the negro. In this case the range of colour is fairly wide, and it is open to those whom it pleases to divide this or any other family into two halves, containing the lighter and darker members respectively. The difficulty of such a classification is that the dark mahogany members are quite distinct from negroes and the paler mahogany from mulattos.

Figs. (ix) and (x) give a dark chocolate coloured girl whose mother was the offspring of a mulatto and a slightly higher white strain (? quadroon) and father a negro. We see at once a softening of the Sambo tint.

It will be clear that the crosses $(LD) \times (LL)$ and $(LD) \times (LD)$ are more likely to give us definite answers to our problem than $(LD) \times (DD)$ owing to the considerable colour range in the Sambo. The next investigation therefore turns on $(LD) \times (LD)$ which should give us the segregation in its simplest form. I therefore asked the fourth question, but with some diffidence it must be confessed.

(4) Mulatto × mulatto. Does or does not this cross usually give a mulatto in colour? The theorists say that 25 p.c. should be pure white skins, 25 p.c. pure black skins and only 50 p.c. mulattos.

Answer. "This statement of those whom you call the theorists is the most ridiculously incorrect of the lot; indeed it would be very comic to make this statement in public before persons who knew. There are now and then slight variations from the usual mulatto brown or mulatto yellow, but you may be quite certain that no pure black skins nor pure white skins come from mulatto × mulatto. You can state this dogmatically."

I may add a few remarks more. Did Mendelism apply to the skin colour of the crosses between dark and light races, we should expect to find only three tints, the light, the dark and the hybrid, whatever the latter may be. The most distant "touch of the tar brush" would be visible, if visible at all, in the presence of the light mahogany of the mulatto. Yet the colour is just visible in the case of the offspring of a quadroon and a pure white I am familiar with, but is hardly discoverable in the case where one parent is a pure white and the other a cross between octoroon and quadroon. I think it probable that characters other than skin colour would offer better material for a possible "mendelising." The negroid lip, the crimped hair, the characteristic *alae nasi*, and the peculiar temper are qualities which can sometimes be traced after the disappearance of all colour. It is conceivable that they would fit the Mendelian theory closer than skin colour, and they serve better than colour to predict a distant negroid strain *.

Finally, I may say that I do not propose to ask my readers to take the views of my correspondent as conclusive, but they do, I think, deserve great weight. He has mixed all his life with all sorts and conditions of colours, and come into

* Another correspondent with 32 years' experience in a West Indian Island confirms the opinions of my first correspondent, i.e. that blended colour is correct in the cases of mulatto, Sambo and quadroon. If a blackish child occurred in a family which should be mulatto, he would hold that the child was fathered by a black man. In fact he attributes to illicit connexion of mixed races any exceptions to the ordinary rule, and cites as evidence of West India experience the story of the man who said he was so dark in colour because a negro ran after his white mother when she was first married; the reply of the sceptic being: "I guess that nigger caught your mother." The same authority notes that if mulattos intermarry for some time the skin tends to get lighter in colour, but a full blooded negro also gradually inclines to become light in hue ("Pears' soap colour") if in a good position and subject to civilising influences. Lastly I may remark that he has noticed that the "bouquet d'Afrique" occurs sometimes in a pronounced form in one or two members of cross-blood families, even in Octoroons. Is this a true segregation?

FIG. (i)

FIG. (iv)

FIG. (v)

FIG. (ii)

FIG. (iii)

FIG. (vii)

FIG. (viii)

FIG. (vi)

FIG. (ix)

FIG. (x)

Figs. (i)—(iii)=pure negro. Fig. (iv)=negro × white. Fig. (v)=pure white. Figs. (vi), (vii), and (viii)=mulatto × negro. Figs. (ix) and (x)=mulatto-quadroon × negro.

contact with them every day in a large but poor practice. He has, I feel sure, no bias to any theory of heredity, and I think my questions first put the modern theory before him. The main point is that the segregation in the second generation to pure white or black skins does not occur. One quotation more from his letters, which had reference to the question of whether the lighter shades of the mixed race might have a dark skin as a latent quality.

"Now I think the question you wanted an answer to is this: When the mixed breed approaches the European side, are there reversions to a definitely negroid type? You reserved your opinion when I saw you in the summer, until I had formulated my experience. That experience is that such reversions are comparatively rare, sufficiently rare to be practically disregarded in a court of law in the decision of bastardy paternity cases. I cannot give you definite statistics, the subject, as you may well imagine in a mixed race community like this, bristles with delicate social difficulties. After many years of medical practice here among all classes and colours I feel sure that I am justified in saying that the reversions to the negroid type are *distinctly* uncommon. Of course in families of the mixed breed you will often see a difference in *colour* pure and simple; this is not at all uncommon, and I would make a marked distinction between this phenomenon and the phenomenon of a throwback to the negro. You will not infrequently see the same thing in European families, and if you are going to consider it in the case of Englishman × Negro, you must also consider how it would apply in the case of Englishmen × Englishwomen."

I take it that my correspondent is here referring to the continuous variability within the family—demonstrably inheritable,—which some disciples of Mendel term "fluctuating" variability and believe to have no importance for the theory of heredity.

"'Sports' or 'throwbacks' do occur, but are really rare; the milder form, i.e. the form which is *barely* evident in tint is not uncommon, but only a practised or accurately observing eye would detect it. 'Sports' to the pure white or the pure negro are practically unknown; in all my life I have not heard of a single one."

In view of the opinions I have cited above, I think, the suggestion that skin colour 'mendelises' should not be vaguely made until some very definite evidence in its favour is forthcoming. I should welcome any views on the above four questions from those having life-long experience of mixed races, or having from mission or medical work special opportunities of studying the offspring of mixed races. Actual data as to skin tints taken on Broca's or von Luschan's scales would be very valuable, and any photographs of individuals of mixed race, taken when possible alongside individuals of the two pure races, will receive a ready publication in this journal.

ÜBER DIE LÄNGENVARIATION DER CONIFERENNADELN.

Von A. HEYER (St. Gallen).

Im 1. Heft des 1. Jahrganges dieser Zeitschrift (Okt. 1901) veröffentlichte mein Freund Herr Prof. Dr. Ludwig in Greiz in seiner Arbeit *Variationsstatistische Probleme u. Materialien* u. a. auch meine Messungen der Nadeln einer Kiefer (*Pinus silvestris*). Auf pag. 22 l. c. zitiert er eine briefliche Mitteilung, in welcher ich ihm von einer "Einheitslänge" gesprochen hatte, deren Multipla die Kurvengipfel zu bestimmen scheinen. Als diese Einheitslänge drängte sich mir schon bei den ersten Tausendmessungen die Länge von 7 mm. auf. Ich liess dann die Sache Jahre lang liegen u. beschäftigte mich mit den Correlationsverhältnissen zwischen Länge u. Breite der Laubblätter von Prunus spinosa (Referat in den Verhandlungen der Schweiz. Naturforschenden Gesellschaft 1906 in St. Gallen), wobei in der Längenvariation der Blattspreite merkwürdigerweise auch die Gipfelzahlen 24 u. 28 mm. zum Ausdruck kamen, die ich bei *Pinus silvestris* gefunden hatte. Besonders diese Tatsachen bestimmten mich, wieder zu den Coniferen zurückzukehren, um auch an anderen Arten die Längenvariation der Nadeln zu studieren.

Ich stellte mir die Aufgabe, die Untersuchung über alle in der Schweiz wild wachsenden Coniferen auszudehnen. Das ist nun in den letzten 1½ Jahren geschehen. Wenn es auch erwünscht wäre, besonders von den langnadeligen Arten noch andere Individuen herbeizuziehen, so scheinen mir doch die bisher gewonnenen Resultate einer vorläufigen Publikation wert zu sein. Ich hoffe dadurch auch andere Forscher anzuregen, sich auf diesem etwas verlassenen Felde zu betätigen, wo die Arbeit zwar mühsam u. zeitraubend ist, wo aber sicher wertvolle Resultate zu gewinnen sind.

Gemessen wurde stets frisches Material u. zwar mit einem gewöhnlichen in Millimeter eingeteilten Massstab. Die Längen wurden in ganzen Millimetern niedergeschrieben u. die Resultate in der Regel nach 1000 Messungen geordnet.

Um einen bequemeren Vergleich zu ermöglichen, habe ich bei den kurznadeligen Arten, wo zugleich mehrere Individuen zur Untersuchung gelangten, die Frequenzen auf $^0/_{00}$ reduziert u. die graphische Darstellung nach dieser Reduktion vorgenommen.

I. *Picea excelsa Link.*

A. 15—20 Jahre alter Baum in einem Garten auf der Südseite meiner Wohnung.

Ich wollte zuerst feststellen, ob das Alter der Sprosse oder die Orientierung der Sprosse einen Einfluss auf die Variationskurve ausübe u. nahm deshalb vier getrennte Messungen vor: an der Ost- u. an der Nordseite des Baumes u. je Nadeln von letztjährigen u. von älteren Sprossen.

(1) 2700 *Nadeln von letztjährigen Sprossen von der Nordseite.* (Fig. 1.)

8	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24* mm.	
5	12	20	76	159	263	**375**	340	343	**358**	286	202	132	79	33	14	3	(2700)
2	4	7	29	59	97	**139**	126	127	**133**	106	75	49	29	12	5	1	‰

(2) 2700 *Nadeln von älteren Sprossen von der Nordseite.* (Fig. 2.)

9	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25* mm.	
14	45	91	197	270	**369**	355	350	**419**	303	138	64	38	27	12	7	1	(2700)
5	17	34	73	100	**137**	131	130	**155**	112	51	24	14	10	4	2	1	‰

(3) 2700 *Nadeln von letztjährigen Sprossen von der Ostseite.* (Fig. 3.)

10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28* mm.	
4	21	62	141	261	302	354	**442**	370	237	175	135	64	36	33	20	19	15	9	(2700)
1	8	23	52	97	112	131	**164**	137	88	65	50	24	13	12	8	7	6	3	‰

(4) 2700 *Nadeln von älteren Sprossen von der Ostseite.* (Fig. 4.)

9	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27* mm.	
6	48	103	233	366	**401**	326	282	**354**	290	125	74	32	15	19	15	7	3	1	(2700)
2	18	38	86	136	**148**	121	104	**131**	107	46	27	12	6	7	6	3	1	1	‰

Übersicht

	Variationsweite	Gipfel
(1)	8—24 mm.	14 u. 17 mm.
(2)	9—25 mm.	14 u. 17 mm.
(3)	10—28 mm.	14 (angedeutet) u. 17 mm.
(4)	9—27 mm.	14 u. 17 mm.

Diese Ergebnisse zeigen, dass an unserm Baume weder die Stellung der Nadeln an Zweigen verschiedenen Alters, noch die Orientierung der Zweige einen wesentlichen Einfluss auf die Variationskurve hatten.

B. Gleich alter Baum wie A, nur wenige Meter von ihm entfernt stehend. Ich wollte an diesem Baume eine Kontrolle darüber ausüben, ob das Alter der Zweige tatsächlich keinen Einfluss auf den Verlauf der Variationskurve habe. Ich mass deshalb je 1350 Nadeln von letztjährigen u. von älteren Sprossen von der Nordseite des Baumes.

(1) 1350 *Nadeln letztjähriger Sprosse.* (Fig. 5.)

8	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24* mm.	
2	9	22	35	110	157	**189**	150	147	**200**	139	72	52	36	24	5	1	(1350)
1	7	16	26	81	116	**140**	111	109	**148**	103	53	39	27	18	4	1	‰

(2) 1350 *Nadeln älterer Sprosse.* (Fig. 6.)

8	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	mm.
1	2	12	37	119	156	**176**	171	177	**198**	150	92	38	15	5	1	(1350)
1	2	9	27	88	115	**130**	127	131	**147**	111	68	28	11	4	1	‰

Sowohl Variationsweite als auch die Lage der Gipfel stimmen miteinander überein, aber auch mit den Resultaten von A.

C. Gleich alter Baum wie A u. B, in unmittelbarer Nähe derselben. Die Nadeln wurden ohne Wahl von alten u. jungen Zweigen gepflückt (Fig. 7).

9	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	mm.
8	67	220	406	699	**904**	842	700	562	445	299	197	124	84	57	40	12	2	(5668)
1	12	39	72	123	**160**	148	123	99	78	53	35	22	15	10	7	2	1	‰

Die Variationsweite erstreckt sich von 9—26 mm., also ungefähr wie bei den vorhergehenden Kurven, hingegen ist diese Kurve unsymmetrisch *eingipfelig*, mit Gipfel bei 14 mm.

D. Nadeln aus dem Gipfel eines etwa 40 Jahre alten Baumes aus dem Walde von Peter u. Paul (Fig. 8).

9	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	mm.
7	28	88	214	403	**666**	579	462	276	76	4	(2803)
3	10	31	76	144	**238**	207	165	99	27	1	‰

Variationsweite von 9—19 mm., Gipfel bei 14 mm.

E. Hier wurden von unserm Christbaum die Endsprosse des zweitobersten Quirls abgeschnitten u. die Nadeln von zweien derselben gemessen (Fig. 9).

10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	mm.
3	41	118	168	**225**	173	49	2	(779)
4	53	151	215	**289**	222	63	3	‰

Variationsweite 10—17 mm., Gipfel bei 14 mm. Muster eines eingipfeligen, symmetrischen Variationspolygons.

F. Ein 80—100jähriger alleinstehender Baum nördlich vom Institut Dr. Schmidt. Einer meiner Schüler, A. Jobin, mass von den ihm erreichbaren Ästen 4015 Nadeln (Fig. 10).

2	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
3	6	26	50	66	**88**	79	91	89	157	302	404	**426**
1	2	6	12	16	**22**	20	23	22	39	76	101	**106**

15	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	mm.
418	376	310	**324**	306	210	126	76	62	20	(4015)
104	94	77	**81**	76	52	31	19	15	5	‰

Die Variationsweite erstreckt sich von 2 bis 24 mm. Die Gipfel liegen bei 7, 14 u. 18 mm. Diese Messungen wurden im Frühling ausgeführt, die übrigen im Winter, wodurch vielleicht die tiefe untere Variationsgrenze erklärt ist. Neu sind die Gipfel bei 7 u. bei 18 mm.

II. *Abies alba Mill.*

A. Ein circa 20jähriger Baum aus dem Stadtpark in St. Gallen (Fig. 11).

4	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
1	1	6	27	59	104	141	208	293	362	**377**	322	266
1	1	2	7	17	30	40	59	83	103	**108**	92	76

17	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28* mm.	
268	240	214	202	137	86	72	46	34	17	14	**3**	(3500)
77	68	61	57	39	25	21	13	10	5	4	1	‰

Die Länge variiert also zwischen 4 u. 28 mm. u. die Gipfel liegen bei 14 u. 17 mm.

B. Ein circa 70—80jähriger Baum aus dem Sitterwald. Nadeln von den vom Boden erreichbaren Ästen (Fig. 12).

7	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
4	18	26	55	68	87	123	**126**	113	103	90	75	68	56
3	13	19	39	49	62	88	**90**	81	73	65	54	48	40

21	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34* mm.	
60	**67**	47	34	**41**	35	31	28	25	8	5	3	3	1	(1400)
43	**48**	33	24	**29**	25	22	20	18	6	4	2	2	1	‰

Variationsweite von 7 bis 34 mm. Gipfel bei 14, 22 u. 25 mm.

C. Ein 60—70jähriger Baum aus dem Sitterwald. Nadeln der vom Boden erreichbaren Äste (Fig. 13).

7	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*
2	2	9	20	30	61	75	123	207	244	**355**	332	250	224	253
1	1	2	4	7	13	17	27	46	52	**79**	74	56	50	56

22	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35* mm.	
281	290	**310**	283	253	245	217	155	125	94	48	18	3	2	(4511)
62	64	**69**	63	56	54	48	34	28	21	11	4	1	1	‰

Die Länge der Nadeln variiert zwischen 7 u. 35 mm. Die Gipfel liegen bei 17 u. 24 mm.

D. Ein ca. 15jähriger Baum am Waldrand zwischen Kronbühl u. Steinach (Fig. 14).

7	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
1	2	4	8	25	55	115	171	227	244	**309**	286	258
1	1	1	2	7	16	33	49	65	70	**88**	82	74

20	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29* mm.	
268	**324**	297	262	233	162	126	71	47	5	(3500)
77	**93**	85	75	67	46	36	20	13	1	‰

Die Länge variiert zwischen 7 u. 29 mm. u. die Gipfel liegen bei 17 u. 21 mm.

III. *Larix decidua Mill.*

A. Etwa 15 Jahre alter Baum im Sitterwald. Es wurden nur die Nadeln der Kurztriebe gemessen (Juli 1908). (Fig. 15.)

6	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	
3	14	29	35	59	78	98	121	132	158	189	**237**	202	
1	5	10	12	20	26	33	40	44	53	63	**79**	67	

19	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	mm.
212	227	**247**	210	186	164	153	130	67	47	2	(3000)
71	76	**82**	70	61	55	51	43	22	16	1	‰

Variationsweite von 6 bis 29 mm. Gipfel bei 17 u. 21 mm.

B. Etwa 30 Jahre alter Baum im Sitterwald. Nur Nadeln von Kurztrieben (Juli u. Aug. 1908), (Fig. 16).

8	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
2	6	5	7	30	54	62	84	100	**149**	124	103	105	134	138	142	142	168
1	1	1	2	7	12	14	19	22	**33**	28	23	23	30	31	32	32	37

26	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*	mm.
208	253	**327**	310	343	**356**	327	270	192	159	94	69	31	5	1	(4500)
46	56	**73**	69	76	**79**	73	60	43	35	21	15	7	1	1	‰

Die Länge variiert zwischen 8 u. 40 mm. Die Gipfel liegen bei 17, 28, 31 mm.

B*. Es wurden nun noch 500 Nadeln von Langtrieben dieses Baumes gemessen (Fig. 17).

7	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	
1	5	4	5	8	28	41	**58**	39	51	57	**75**	45	
2	9	8	9	15	53	78	**110**	74	97	108	**143**	86	

20	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	mm.
29	19	11	12	9	11	5	3	2	3	1	4	(526)
55	36	21	23	17	21	9	6	4	6	2	8	‰

Hier variiert die Länge zwischen 7 u. 31 mm., die Hauptgipfel liegen bei 14 u. 18 mm.

IV. *Pinus montana Mill, var. pumilio.*

Von einem in einer Anlage der Stadt St. Gallen stehenden Exemplar wurden 19000 Nadeln gemessen u. zwar von je zwei beisammen stehenden nur eine, weil die beiden meistens gleich lang sind. Weil mir an der Lage des hier auftretenden Gipfels sehr viel liegt, so gebe ich zwei Zahlenreihen: die erste zeigt die Ergebnisse nach 8000 Messungen, die zweite nach 19000 Messungen, u. zwar blieb von 8000

bis 19000 bei Controlle von 1000 zu 1000 der Gipfel unverändert auf 49 mm. (Fig. 18).

14	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*
2	1	5	2	4	5	9	14	15	18	26	30	29	45	42	56	78	68	82	113
3	2	7	4	7	12	20	20	22	30	47	59	61	85	97	109	125	135	161	198

34	*35*	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*	*45*	*46*	*47*	*48*	*49*	*50*
120	144	168	170	203	223	210	207	266	287	335	419	424	436	429	**453**	428
225	276	326	381	415	428	440	461	542	561	689	790	803	844	847	**871**	796

51	*52*	*53*	*54*	*55*	*56*	*57*	*58*	*59*	*60*	*61*	*62*	*63*	*64*	*65*	*66*
319	293	296	226	211	149	150	146	124	105	63	59	45	54	39	28
736	730	695	634	600	541	493	472	442	372	316	305	268	246	216	176

67	*68*	*69*	*70*	*71*	*72*	*73*	*74*	*75*	*76*	*77*	*78*	*79*	*80*	*81*	mm.
38	27	18	13	8	8	3	6	4	1	1	—	—	—	—	(8000)
185	146	111	97	72	49	52	40	40	31	15	11	7	2	1	(19000)

Die Variationsweite war also nach 8000 Messungen von 14 bis 77 mm.; durch Hinzukommen längerer Nadeln verschob sie sich nach oben um 4 mm. bis 81 mm. Der Gipfel 49 aber blieb unverändert.

V. *Pinus Cembra L.*

A. Ein etwa 15jähriger Baum in einem Garten am Rosenberg, St Gallen (Fig. 19).

Es wurde von den 5 an einem Kurztriebe stehenden Nadeln je nur eine gemessen, da die 5 meist gleich lang sind.

10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*
1	—	3	3	3	3	1	5	3	9	8	5	6	5	9	12

26	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*	*41*
13	16	18	21	23	18	18	21	31	36	35	40	32	49	55	38

42	*43*	*44*	*45*	*46*	*47*	*48*	*49*	*50*	*51*	*52*	*53*	*54*	*55*	*56*	*57*
44	67	57	81	83	76	76	**102**	86	84	94	83	90	98	96	**114**

58	*59*	*60*	*61*	*62*	*63*	*64*	*65*	*66*	*67*	*68*	*69*	*70*	*71*	*72*	*73*
111	98	93	90	107	**122**	94	97	92	108	108	113	**125**	83	86	78

74	*75*	*76*	*77*	*78*	*79*	*80*	*81*	*82*	*83*	*84*	*85*	*86*	*87*	*88*	*89*
84	73	46	**56**	52	41	32	24	23	**28**	21	9	10	10	5	5

90	*91*	*92*	*93*	*94*	*95*	*96*	*97*	mm.
4	—	—	—	—	—	—	1	(4000)

Die Variationsweite erstreckt sich hier von 10 mm. bis 90, resp. 97 mm. Die Zahl der Messungen ist noch viel zu klein, um bei einer so grossen Variationsweite festsitzende Gipfel zu liefern. Immerhin erscheinen die Anhäufungen bei 49, 57, 63, 70, 77 u. 83 mm. bemerkenswert.

B. Ein Baum aus der Umgebung von Pontresina (Engadin). Über das Alter desselben habe ich keine Anhaltspunkte (Fig. 20).

20	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*
1	3	4	6	5	6	9	4	15	10	16	22	18	19	19
35	*36*	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*	*45*	*46*	*47*	*48*	*49*
31	27	43	41	58	70	80	71	98	109	124	138	178	194	209
50	*51*	*52*	*53*	*54*	*55*	*56*	*57*	*58*	*59*	*60*	*61*	*62*	*63*	*64*
234	250	289	304	300	320	**365**	349	362	**368**	348	302	300	283	261
65	*66*	*67*	*68*	*69*	*70*	*71*	*72*	*73*	*74*	*75*	*76*	*77*	*78*	*79*
259	206	216	200	148	124	101	84	79	56	46	43	25	39	26
	80	*81*	*82*	*83*	*84*	*85*	*86*	*87*	*88*	*89*	*90*	*91*	*92*	mm.
	31	15	14	4	8	7	3	2	—	—	—	—	1	(8000)

Die graphische Darstellung zeigt, dass die Zahl der Messungen an diesem Baume noch um einige Tausend vermehrt werden müsste, um ein einwandfreies Polygon zu liefern. Leider war es mir einfach unmöglich, das dazu notwendige Material zu bekommen. Die Variationsweite erstreckt sich von 20 bis 87 resp. 92 mm. u. die Gipfel liegen bei 56 u. 59 mm. Beim Vergleich der Variationspolygone der beiden Bäume A u. B, als von letzterem 4000 Nadeln also ebenso viel wie von A gemessen waren, fiel mir auf, wie der Engadiner Baum ein viel einheitlicheres Polygon mit einem einzigen deutlichen Hauptgipfel (bei 59) aufwies als der in St. Gallen gewachsene Baum A. Ich vermutete, dass hier das Klima von Einfluss sein könnte, weil das Engadin zwar einen kurzen Sommer, aber mit fast stets schönem Wetter aufweist, so dass das Wachstum ungestört vor sich gehen kann, während St. Gallen mit vielen trüben u. Regentagen ausgezeichnet ist, an denen die Temperatur rasch fällt u. so das Wachstum hemmen muss. Es wäre eine Frage für sich, durch weitere Messungen diesen Beziehungen nachzugehen.

VI. *Taxus baccata L.*

A. Ziemlich alter Baum im Sitterwald bei St. Gallen. Da derselbe einen üppigen Stockausschlag besitzt, so mass ich die Nadeln dieses Ausschlags (7000) u. die der Krone 5000 besonders.

(1) *Nadeln des Stockausschlags.* (Fig. 21.)

9	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*
1	19	32	72	107	**147**	140	163	**250**	227	217	230	274	291
23	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*
313	**327**	298	299	327	**404**	332	317	288	**295**	264	228	182	165
37	*38*	*39*	*40*	*41*	*42*	*43*	*44*	*45*	*46*	*47*	*48*	*49*	mm.
175	148	107	101	76	**77**	43	26	19	7	7	4	1	(7000)

(2) *Nadeln aus der Krone.* (Fig. 22.)

10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	
7	24	39	52	79	**80**	74	**110**	99	105	112	133	156	
23	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	
179	**207**	193	208	242	**296**	278	248	263	**294**	274	258	251	
			36	*37*	*38*	*39*	*40*	*41*	*42*	*43*	*44*	*45*	mm.
			208	205	132	79	48	28	22	12	4	1	(5000)

Bei (1) variiert die Länge zwischen 9 u. 49 mm. u. die Gipfel liegen bei **14**, **17**, **24**, **28**, **32**, **37**, **42** mm. Bei (2) erstreckt sich die Variationsweite von **10** bis **45** mm. u. die Gipfel liegen bei **15**, **17**, **24**, **28**, **32** mm.

B. Baum neben meiner Wohnung, angebaut.

6	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	
3	17	44	77	121	199	311	402	473	565	668	1024	**1054**	995	881	
21	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	mm.
769	708	499	373	234	181	125	99	65	49	26	20	11	4	3	(10000)

Die Kurve ist eingipfelig, Gipfel bei 18 mm., während die Variationsweite zwischen 6 u. 35 mm. liegt.

VII. *Juniperus communis L.*

Ein Strauch von der Hinterkreuzalp bei Trogen (St. Appenzell).

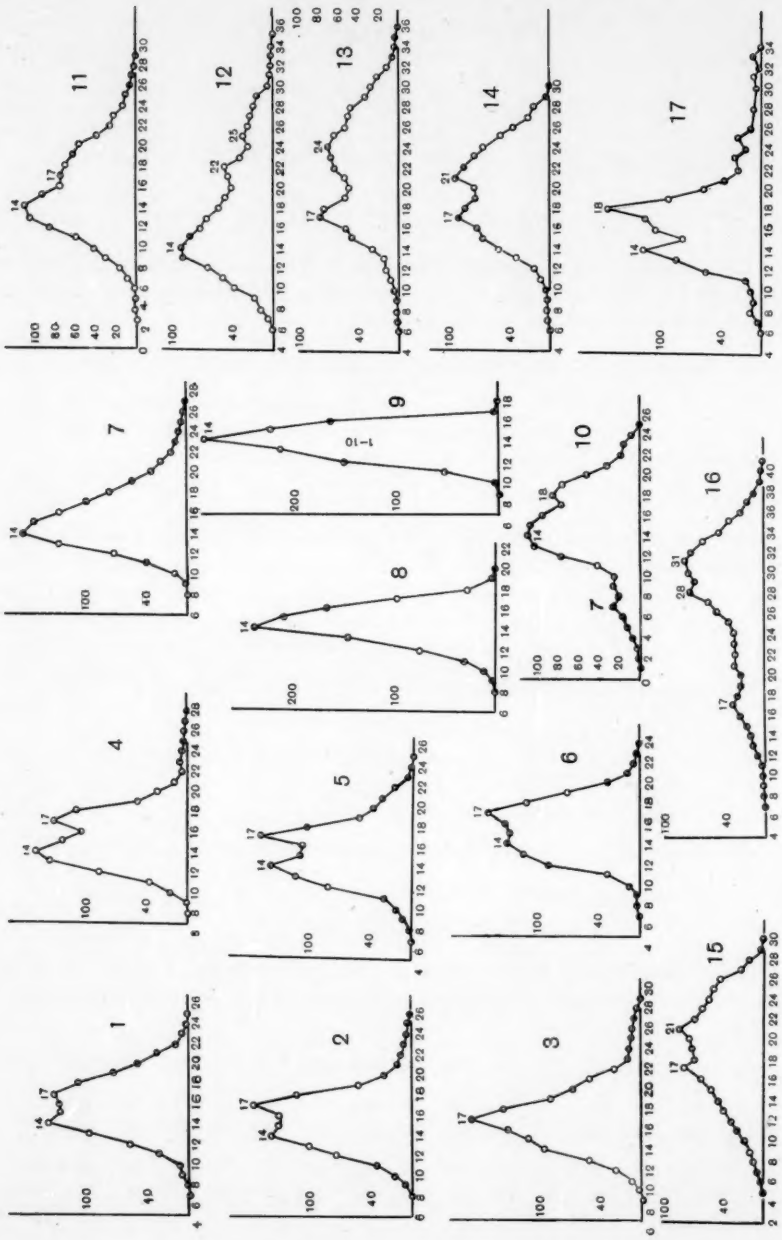
3	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	
11	39	73	93	130	**160**	151	165	179	207	
13	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	mm.
224	**254**	238	204	151	95	63	33	20	10	(2500)

Variationsweite von 3 bis 22 mm., Hauptgipfel bei 14 mm., Nebengipfel bei 8 mm. (Fig 24).

VIII. *Pinus silvestris L.*

Der Vollständigkeit wegen wiederhole ich auch noch die Zahlen von *Pinus silvestris*, die in der eingangserwähnten Arbeit von Ludwig schon publiziert sind.

7	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	
8	15	32	27	47	55	114	136	183	233	317	386	463	530	603	
22	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*	*36*	
701	773	922	820	807	832	921	727	602	469	390	263	189	140	102	
		37	*38*	*39*	*40*	*41*	*42*	*43*	*44*	*45*	*46*	*47*	*48*	*49*	mm.
		69	52	27	18	8	4	5	1	2	3	—	2	2	(12000)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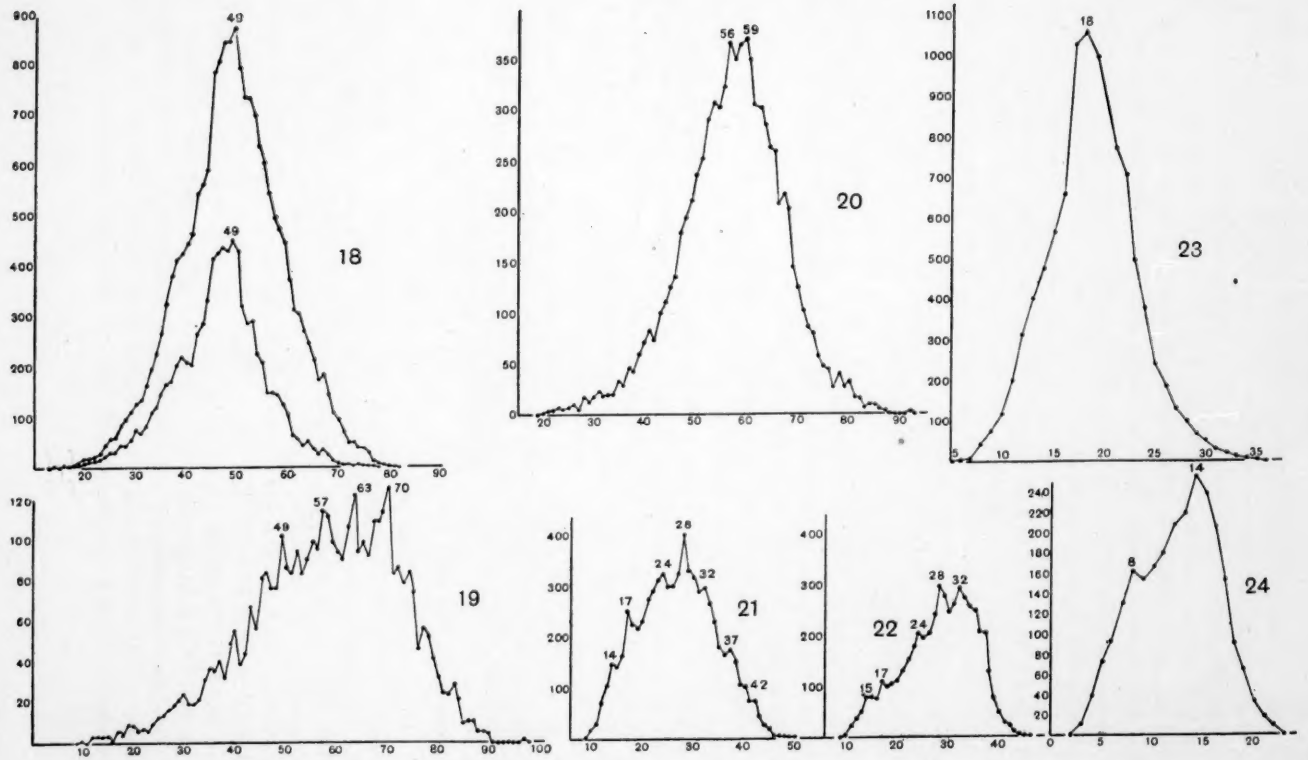
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Die Variationsweite liegt zwischen 7 u. 49 mm. u. die Gipfel liegen bei 24 u. 28 mm.

Vergleicht man nun die Gipfel bei den verschiedenen Arten, so fällt vor allem auf, dass die gleichen Gipfelzahlen wiederkehren, ohne Rücksicht auf die Art. Es sind das die Gipfel 14 u. 17 bei den kurznadeligen, dann 24, 28, 32 bei den Pflanzen mit mittellangen Nadeln. Auch 49 kommt zweimal vor. Stellt man von allen untersuchten Pflanzen die Gipfelzahlen zusammen (wobei ich für die Bäume mit mehreren Zahlenreihen stets nur *eine* berücksichtige), so ergibt sich, dass von den 52 deutlich ausgesprochenen Gipfeln 26 auf Multipla der Länge 7 mm. fallen $[1\cdot(7)+11\cdot(14)+3\cdot(21)+4\cdot(28)+1\cdot(42)+2\cdot(49)+1\cdot(56)+1\cdot(63)+1\cdot(70)+1\cdot(77)]$, 21 fallen in die Mitte zwischen solche Zahlen hinein u. 5 fallen anderwärts. (Zählt man jede vorkommende Gipfelzahl nur einmal, so erhält man 21 Gipfelzahlen u. davon sind 10 Multipla von 7.) Solche Mittelzahlen wären zwar genau 10,5; 17,5; 24,5; 31,5 etc. mm. Da aber mit der Millimeter-Einheit gemessen wurde, betrachte ich die auf die benachbarten Ganzen fallenden Gipfel als eigentlich in die Mitte gehörend, zumal ausser 17 tatsächlich auch 2 Mal der Gipfel 18 auftritt, ausser 24 auch der Gipfel 25, ausser 32 auch der Gipfel 31. Bei der schön gebauten Kurve Fig. 23 tritt deutlich die Tendenz hervor, den Gipfel zwischen 17 u. 18 zu fixieren.

Es scheint demnach, dass in der Tat eine "Einheitslänge," wie ich sie schon früher vermutet hatte, bei der Fixierung der Gipfel eine Rolle spiele. Vielleicht ist diese "Einheitslänge" 7 mm. u. die zwischen den Multiplen gelegenen Gipfel sind Summationsgipfel, entstanden durch die Combination zweier Kurven mit Gipfeln bei den benachbarten Multiplen von 7 mm. Oder aber die "Einheitslänge" ist 3,5 mm. u. die Multiplen davon wären 7; 10,5; 14; 17,5; 21; 24,5; 28; 31,5 etc. Es sei noch besonders darauf hingewiesen, dass die Variation oft in der Nähe von 7 mm. beginnt u. in der Nähe der oben hervorgehobenen Zahlen aufhört, ohne dass ich einen sehr grossen Wert auf die wirklichen Anfangs- u. Endpunkte der Kurve legen möchte, da ja der Zufall eine sehr grosse Rolle spielt, indem er uns einige wenige Nadeln, welche diese Endpunkte bestimmen, in die Hände spielt oder aber vorenthält.

Es ist nun auffallend, dass die von mir bei den Coniferen gefundenen Gipfelzahlen auch bei Laubhölzern vorkommen. Ich selbst hatte einige derselben bereits bei den Blättern von *Prunus spinosa* ermittelt. In einer interessanten Arbeit *Beiträge zur Physiologie des Flächenwachstums der Pflanzen* von G. Ritter (*Bot. Centralblatt*, Bd. XXII. Abt. II. 1907) wird versucht, diese Gipfellagen zu interpretieren. Es handelt sich dabei um die Längenvariation der Laubblätter von *Vaccinium Vitis Idaea, V. Myrtillus* u. *Myrtus communis* u. es werden die Gipfel bei 10, 14, 17, 20, 22, 24, 26, 28, 32, 36 mm. gefunden. Diese Zahlen verhalten sich wie die Quadratwurzeln aus den Fibonaccizahlen der Haupt- u. Nebenreihe. Wenn nun das Längenwachstum pflanzlicher Organe schubweise nach der Fibonaccireihe erfolgt, so ist es sehr plausibel, dass beim Flächenwachstum der Zuwachs in einer Dimension schubweise nach den Quadratwurzeln aus diesen Zahlen vor

sich geht. Nun fragt es sich: handelt es sich bei den Coniferennadeln auch um Flächenwachstum in dem Sinne wie bei den Laubblättern der oben genannten Pflanzen? Doch wohl kaum. Hier sollte man annehmen dürfen, geeignetes Material für das Studium des Längenwachstums vor sich zu haben. In diesem Falle liesse sich schwer erklären, wie die Gipfel trotzdem kollidieren.

Ausserdem bin ich nicht überzeugt, dass die Gipfel bei 20 u. 22 mm. in den Ritter'schen Reihen echte Gipfel sind. Zwei Gipfel, die nur durch eine einzige Klasse getrennt sind, kommen mir immer verdächtig vor, besonders wenn sie geraden Zahlen angehören, weil—ich habe einige Erfahrung darin—diese Zahlen stets unwillkürlich bevorzugt werden auf Kosten der ungeraden. Es wäre sehr gut möglich, dass 21 der wahre Gipfel wäre, u. dann würde er in meine Zahlenreihe passen (siehe übrigens Ritter l. c. Fig. 3).

Vorläufig, nachdem verhältnismässig noch wenig Material vorliegt, kann die Theorie jedenfalls keine endgültigen Sätze aufstellen. Die nächste Aufgabe auf diesem Gebiete wird sein, durch grosse Zahlen die Gipfel definitiv festzustellen, ganz besonders aber diejenigen der höhern Klassen, durch Untersuchung von Material von recht ausgedehnter Variationsweite.

STATISTICAL STUDY OF ANTI-TYPHOID INOCULATION.

By G. D. MAYNARD, F.R.C.S.E., Pretoria.

In a paper read before the South African Medical Congress of 1908, Major Buist, R.A.M.C., has collected a considerable number of figures relating to anti-typhoid inoculation. The conclusion that he considers these figures lead to is that inoculation is of decided benefit, both in preventing attack and in lowering the case mortality. It seemed that in view of the sparseness of the statistics at present available, it was more than ever desirable to examine such as we have by modern statistical methods. To base deductions on percentages, apart from their probable errors, is likely to lead to wrong conclusions; and it is only by the help of methods such as those here employed that we can hope to learn all that the data signify.

The statistics used in this paper have been obtained from the above-mentioned source, with the exception of the table containing the Transvaal figures, which were kindly supplied to me by Major Buist at a later date.

The coefficients of correlation—between inoculated and freedom from attack, and between attacked and recovery (in the inoculated)—have been calculated by the "four-fold table" method of Professor K. Pearson. The probable error of these values has been assumed to be three times the error found by the formula $E_r = \cdot 67449\,(1-r^2)/\sqrt{(n-1)}$. In two cases the long method was employed to check these results, but in neither case was the difference material.

The figures contained in Tables I and II were obtained from a census of the whole army, taken by the military authorities. The data are admittedly incomplete owing to the absence of some of the troops on manœuvres or on board ship, and further it is not certain that all cases of inoculation were correctly returned as such. The period covered is from March 1, 1906, to February 28, 1907. Although Major Buist quoted data for the inoculated in the British Isles, these

have not been used in this paper. No case of enteric having occurred among the inoculated, the correlation would have appeared high; but the absence of a case amongst a small number of inoculated men has clearly no significance in view of the comparative rarity of the disease, and the small probability of a man, inoculated or uninoculated, being attacked. Tables III and IV refer to local outbreaks in two regiments following their removal abroad. Tables VI and VIII contain statistics obtained from seven large Indian Stations, between January 1 and June 30, 1907; these returns are stated by Major Buist to be the most complete, and are free from most of the errors that are found in the other figures.

TABLE I.

Results of Antityphoid Inoculation. Stations Abroad.

1/3/06 *to* 28/2/07.

	Inoculation +	Inoculation −	
Not attacked ...	786	30757	31543
Attacked ...	5	193	198
Totals ...	791	30950	31741

$h = -1{\cdot}961324, \quad k = 2{\cdot}498566,$

$$\cdot 9243r^5 - \cdot 56067r^4 + 2{\cdot}48701r^3 - 2{\cdot}45024r^2 + r + \cdot 00202 = 0,$$

$r = -\cdot 0020 \pm \cdot 0114.$

TABLE II.

Indian Stations. 1/3/06 *to* 28/2/07.

	Inoculation +	Inoculation −	
Not attacked ...	2122	37113	39235
Attacked ...	8	770	778
Totals ...	2130	37883	40013

$h = -1{\cdot}142560, \quad k = 2{\cdot}065319,$

$$-\cdot 18698r^6 + \cdot 21417r^5 + \cdot 06927r^4 + \cdot 87398r^3 - 1{\cdot}66701r^2 + r - \cdot 16165 = 0,$$

$r = \cdot 2556 \pm \cdot 0095.$

TABLE III. *17th Lancers in India* *.

	Inoculation +	Inoculation −	
Not attacked ...	148	481	629
Attacked ...	2	58	60
Totals ...	150	539	689

$$h = -\cdot 780018, \qquad k = 1\cdot 358832,$$
$$-\cdot 0109r^5 - \cdot 12184r^4 - \cdot 055239r^3 - \cdot 529956r^2 + r - \cdot 34425 = 0,$$
$$r = \cdot 4802 \pm \cdot 0593.$$

[* The absence in Pretoria of Mr Maynard does not permit me to ascertain from him the source of the total for uninoculated. In Lieutenant Luxmore's Report, *Journal of Royal Army Medical Corps*, Vol. VIII. p. 492, the strength of the regiment is given as 593 including 84 women and children. Of the five officers' wives, three were inoculated; of the 79 remaining women and children *none* were inoculated. This would make the unattacked who were uninoculated about 100 *less* than the number given by Mr Maynard and would *increase* the correlation. The report, however, in its present form is not one from which it is easy to draw any definite conclusions. The actual proportions of the inoculated and uninoculated in the Delhi squad are not given, although it is possible that the visit contributed to the outbreak. It is not clear how far the draft of the regiment numbering 96 which reached India two months later is or is not included in the returns of cases. If wholly uninoculated, it would account for the 96 additional persons in Mr Maynard's table, but some at least appear to have been inoculated (Luxmore, p. 492). If cases of enteric among this draft are included among the last 20 cases reported by Luxmore, then the total 593, given on his p. 492, does not apply to the incidence. Lieutenant-Colonel Leishman writing in the same *Journal*, p. 465, of the outbreak in the 17th Lancers at Meerut says:

"The report of the attached medical officer, Lieutenant Luxmore, furnishes a striking piece of evidence as to the protective effect of the inoculations. .....The uninoculated portion of the regiment served, unintentionally, as 'controls' and the fact that of 63 cases 61 occurred among these controls, and only two among the inoculated men of the regiment, is one the significance of which it is hard to minimise."

According to Lieutenant Luxmore's *Report*, there were only 61 cases (59 uninoculated and two with the first inoculation dose) not 63. Without knowing the totals of inoculated and uninoculated in the regiment it would not be easy to express the significance really borne by Lieutenant-Colonel Leishman's statement. But several other points of view may be suggested of the 150 inoculated; 13 per cent. were officers and officers' wives, whose environment and average age probably differ much from those of the non-commissioned officers and men. Of the 150 inoculated two were attacked; of the 79 uninoculated women and children included on the strength of the regiment only one appears to have been attacked, a rather less percentage than in the case of the inoculated. Further the so-called "controls" cannot be considered as true controls, until it is demonstrated that the men who are most anxious and particular about their own health, the men who are most likely to be cautious and run no risk, are not the very men who will volunteer to be inoculated; thus a spurious correlation may be produced between attack and absence of inoculation. The age frequency of both classes ought to be further given in every report. Clearly what is needed is the inoculation of one half only of the volunteers, equal age incidence being maintained, if we are to have a real control. The subjection of the inoculated and uninoculated to exactly like conditions of service; the exclusion of officers and their wives, and the women and children from the strength on which percentages are based (and the discovery if possible of why these classes are relatively immune!). Useful points even as statistics are now given would be the addition of the age frequencies and the sickness record (other than that of enteric) of the inoculated and uninoculated groups. Until a far higher standard of statistical observation and statistical reduction is adopted, we cannot possibly call, with Lieutenant-Colonel Leishman, the Report of Lieutenant Luxmore a striking piece of evidence as to the protective effect of the inoculations. What is needed at present in the Army Medical Department is a trained statistician alongside the trained bacteriologist. EDITOR.]

TABLE IV.

3rd Coldstream Guards. Cairo 1906—1907.

	Inoculation +	Inoculation −	
Not attacked ...	330	368	698
Attacked ...	1	13	14
Totals ...	381	331	712

$h = -\cdot088128, \quad k = 2\cdot060759,$

$-\cdot10942r^5 + \cdot02823r^4 - \cdot53692r^3 - \cdot090805r^2 + r - \cdot40792 = 0,$

$r = \cdot4987 \pm \cdot0577.$

TABLE V.

Transvaal Districts. 1/3/06 *to* 28/2/07.

	Inoculation +	Inoculation −	
Not attacked ...	219	6690	6909
Attacked ...	5	65	70
Totals ...	224	6755	6979

$h = -1\cdot850840, \quad k = 2\cdot325187,$

$\cdot010105r^5 - \cdot18365r^4 + 1\cdot7815r^3 - 2\cdot151774r^2 + r + \cdot205165 = 0,$

$r = -\cdot1504 \pm \cdot0237.$

TABLE VI.

Seven Large Indian Stations. January 1*st to June* 30*th,* 1907.

	Inoculation +	Inoculation −	
Not attacked ...	2192	7940	10132
Attacked ...	15	173	188
Totals ...	2207	8113	10320

$h = -\cdot793153, \quad k = 2\cdot092043,$

$\cdot01296r^5 + \cdot22566r^4 - \cdot20874r^3 - \cdot82965r^2 + r - \cdot18746 = 0,$

$r = \cdot2395 \pm \cdot0188.$

		$r \quad E_r$	r/E_r	N
Table V.	Transvaal ...	$-\cdot1504 \pm \cdot0237$	6·345	6979
Table I.	Stations Abroad ...	$-\cdot0020 \pm \cdot0114$	0·175	31714
Table VI.	7 Indian Stations ...	$+\cdot2395 \pm \cdot0188$	12·739	10320
Table II.	Indian Stations ...	$+\cdot2556 \pm \cdot0095$	26·905	40013
Table III.	17th Lancers ...	$+\cdot4802 \pm \cdot0593$	8·098	689
Table IV.	Coldstream Guards	$+\cdot4987 \pm \cdot0577$	8·643	712

Mean $= \cdot2203 \pm \cdot0649$.
Mean weighted with $r/E_r = \cdot2745 \pm \cdot0048$.
Mean weighted with $N = \cdot1357 \pm \cdot0003$.

We see that four of these results give a positive and two a negative correlation; and the mean calculated with or without weighted ordinates is positive. In Tables I, II and V, it will be noted that the number of the inoculated is very small compared with the total, and therefore the probable error of the class group—inoculated and attacked—is large. A small alteration therefore in this group (which is to be reasonably expected in another sample from the general population of the inoculated) would consequently largely affect the value of r. A further defect in these tables is the very uneven distribution between inoculated and uninoculated, which brings the division near the tail of the frequency curve, with its disturbing effect on the value of r. From this point of view the most satisfactory statistics are found in Tables III, IV and VI, but the total number of men included in the two former tables is small. It would appear therefore that Table VI (seven large Indian Stations) is the most satisfactory and it has already been stated that it is for other reasons the most reliable. In this case the coefficient of correlation is sensibly positive and $r/E_r = 12{\cdot}739$ and is significant.

The divergent nature of these results calls for some explanation. To some extent it may be due to want of homogeneity in the material, owing to different methods of inoculation being employed, and to other causes. It does not seem probable that the whole effect can be attributed to the results of random sampling and so other factors that might influence the result must be sought for.

There is little doubt that there is more than one disease covered by the term Enteric or Typhoid Fever. Bacteriologically it is well known that several varieties of para-typhoid bacilli exist and are the specific cause of fevers clinically indistinguishable from typhoid. There is no *a priori* reason for assuming that a vaccine prepared from typhoid bacilli would confer immunity against infection with any of the para-typhoid strains, and therefore in a locality where the ratio of para- to true typhoid infections is high we might expect to find the coefficient of correlation between inoculation and freedom from attack correspondingly lowered.

It is, I think, significant that the two highest correlations, i.e. those of the 17th Lancers and the Coldstream Guards, give very similar results and further that both these regiments suffered from well marked epidemics of typhoid, whereas

the other tables contain for the most part the results of sporadic cases, that is, they represent the disease in its endemic form. Now it is well known that typhoid and para-typhoids are clinically indistinguishable, but the latter do not tend to occur in epidemic form so far as is known. We may therefore assume that the two epidemics mentioned were true typhoid, while in the other cases a certain number of para-typhoids are included, and probably in foreign stations many more than would be expected.

Major Statham, R.A.M.C., has, I think, demonstrated beyond all question that in the Transvaal the para-typhoids are quite common. In a consecutive series of cases blood cultures were made from all the patients suffering from typhoidal diseases, and he found that approximately 20 °/₀ of the supposed typhoids were in reality para-typhoids. Again out of a series of 196 cases examined by Widal's method at the Transvaal Government Laboratory, 102 or 52 °/₀ were returned as typhoids, 72 or 37 °/₀ as para-typhoids and 22 or 11 °/₀ as mixed infections with both para- and true typhoid bacilli. That these latter figures represent the actual ratio of distribution is not likely, as it is chiefly in the mild cases that the blood is sent to the Laboratory for examination, and one would expect more "para" cases would be found in this class; yet they serve to demonstrate that the disease is at any rate common in this Colony, and may occur elsewhere with sufficient frequency to materially disturb the statistics bearing on anti-typhoid inoculation*.

I have not been able to obtain any definite figures as to the number of cases of para-typhoid that occur in India, but the following sentence from Major Roberts' *Enteric Fever*, p. 122, is not without interest in this connection. "Out of 1397 admissions to Hospital for enteric in 1904 only 749 were submitted to the ordinary serum test (against *B. typhosus*), of which 526 are declared to have been positive, 198 negative and 25 doubtful. * * * * * * We can only suggest that taking these results as they stand, there is ample room for a large proportion of para-typhoid infections."

If it is permissible to hazard a guess, it would seem likely, from the results found in this paper, that para-typhoids will be found to be relatively more common in South Africa than in India, and that the conflict in the results may be found to be largely due to this cause, although a much larger percentage than that found by Major Statham would be necessary to account for the entire difference. I calculated in Table V the probable error of the Group 5, and deducting this together with 20 °/₀ of its original value the correlation remains negative but very slightly so.

I regret that owing to lack of material I am only able to include two correlation tables showing the relation between inoculation and recovery from attack. They are both from the Indian stations and correspond to Tables II and VI.

* [The ratio of *B. paratyphosus* to *B. typhosus* in the Hygienic Laboratory, Washington, for typhoid fever in the district of Columbia is given as 1 to 8 or 12 °/₀, but only 27 blood tests were made, and many of these gave no bacilli. *Hygienic Laboratory Bulletin*, No. 44, p. 11, Washington, 1908. EDITOR.]

TABLE VII.

India. 1/3/06 *to* 28/2/07.

	Inoculation +	Inoculation −	
Recoveries ...	7	669	676
Deaths	1	101	102
Totals ...	8	770	778

$h = -2{\cdot}315823, \quad k = 1{\cdot}121288,$

$$\cdot01027r^5 + \cdot44556r^4 + \cdot18709r^3 - 1{\cdot}29835r^2 + r - \cdot010804 = 0,$$

$r = \cdot0110 \pm \cdot0725.$

TABLE VIII.

Seven Large Indian Stations. January to June, 1907.

	Inoculation +	Inoculation −	
Recoveries ...	12	131	143
Deaths	3	42	45
Totals ...	15	173	188

$h = -1{\cdot}406510, \quad k = \cdot708378,$

$$-\cdot01003r^5 - \cdot10598r^4 - \cdot08122r^3 - \cdot49817r^2 + r - \cdot071686 = 0,$$

$r = \cdot0745 \pm \cdot1469.$

In both cases the coefficient of correlation is positive but negligible in comparison with the probable error. It will be observed that both these tables are from Indian figures, and although the Stations Abroad show a much lower correlation between inoculation and freedom from attack yet the death-rate in the inoculated and attacked is nil. I have therefore omitted this table from my series for the same reason as is given in the case of the English figures mentioned above. This result would rather tend to strengthen the supposition that some of these latter cases are para-typhoids, for the case-mortality is much lower in this disease than in true typhoid; on the other hand it must not be overlooked that the total number of cases is so small that a death is hardly to be expected.

It is of interest to note that although these two tables give a zero correlation, yet both the groups from which these figures are obtained give a sensible positive correlation in respect to inoculation and freedom from attack. This opens up an important question in the study of immunity. May a process which gives no protection after attack reduce the chance of attack? These tables are too small to draw any definite conclusion from, and although there is unassailable

evidence as to the value of vaccination even when small-pox has been contracted, yet the two processes are not identical, and it is I think safe to say that there is no *a priori* reason for assuming that such a state of affairs might not be.

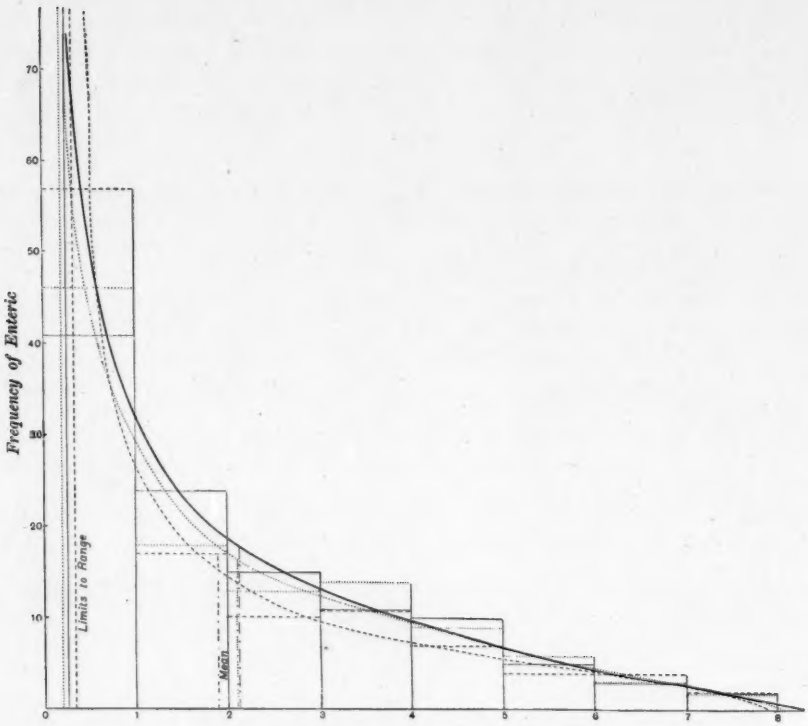
In addition to the figures already dealt with, there is in Major Buist's paper another table apparently compiled to show that the protection conferred by the process does not attain its maximum efficiency at once. Thus we find it recorded that out of 112 men attacked after inoculation 57 contracted the disease within one year, 17 within two, 10 within three, 7 within four, 4 within five, 4 within six, and 2 after the lapse of seven years. As the majority of the men inoculated left for foreign stations shortly after the event, I sought for a comparison amongst the uninoculated in foreign stations to see if there were sufficient grounds for this suggestion. The only figures that I could find that were at all comparable were given in Major Roberts' *Enteric Fever*, obtained from the Army Medical Records, for the troops in India for the years 1900–3. Those given by Major Buist covered a period from 1900–7. The largest proportion of the inoculations took place in the early part of this period. It is true that many of these cases were contracted in South Africa, and that the Indian statistics include some inoculated men, but I do not think that either of these sources of error robs the comparison of all value; for the relative number of the inoculated to the uninoculated is small, and both in South Africa and in India the disease is endemic in a way that it is not in the British Isles, and, further, towards the end of the Boer War enteric fever was probably as rife in South Africa as it ever is in India.

For this comparison to be entirely satisfactory it would be necessary that all the men inoculated should have completed seven years. As this was not the case, I attempted to adjust the figures so as to compensate for this deficiency. Unfortunately each year did not supply an equal number of men, the largest proportion occurring in the first two years of the period, i.e. 1900 and 1901. It was also found impossible to alter the last two groups except by inspection of the plotted figures, as the number of cases occurring in them was so small that the error of one case would make too great a proportional difference. I think the result is an over-correction, and the truth will lie between the crude figures and the corrected ones. It will be seen that neither curve is different in type from that given by the Indian data, and that all the constants only vary by an amount that might certainly be due to random sampling in a homogeneous population. The type is that of Professor Pearson's Type I, and the following are the equations to the curves.

Indian $$y = 23{\cdot}62\left(\frac{x}{6{\cdot}479}-1\right)^{-{\cdot}4105}\left(1-\frac{x}{14{\cdot}538}\right)^{{\cdot}9211};$$

Buist's $$y = 3{\cdot}726\left(\frac{x}{15{\cdot}669}-1\right)^{-{\cdot}6521}\left(1-\frac{x}{8{\cdot}09}\right)^{{\cdot}3367};$$

Buist's modified $$y = 19{\cdot}96\left(\frac{x}{9{\cdot}494}-1\right)^{-{\cdot}4246}\left(1-\frac{x}{15{\cdot}426}\right)^{{\cdot}7793}.$$



Roberts' Enteric Indian Curve.
Buist's Enteric Curve.
Buist's Modified Enteric Curve.

Service	Calculated Ordinates		
	I.	B.	B. M.
·5	52	68·7	45·1
1·5	23·2	18·7	21·5
2·5	15·7	11·8	15·1
3·5	11·4	8·6	11·1
4·5	8·2	6·6	8·2
5·5	5·7	5·1	5·8
6·5	3·8	3·8	3·9
7·5	1·7	1·7	1·7

The chief constants of the curve are given below:—

	Indian*	Buist's	Buist's modified
Mean	2·1577 ± ·0147	1·8928 ± ·1193	2·1273 ± ·1193
Standard Deviation	1·82310 ± ·0143	1·8725 ± ·0844	1·8580 ± ·0844
$\sqrt{\beta_1}$	1·03961 ± ·01974	1·2896 ± ·1561	1·0025 ± ·1561
β_2	3·23810 ± ·9395	3·6814 ± ·3122	3·1054 ± ·3122
κ_1	−2·7660	−3·6267	−2·8040
κ_2	− ·3885	− ·5640	− ·3551
Start	·2639	·3320	·1889 years
End	8·3229	7·9110	8·1210 years

It will be seen from these figures that the three curves are not very dissimilar and that the Indian has a value intermediate between the other two. It seems safe therefore to assume that in the cases quoted by Major Buist we are dealing with a sample of the general population not modified in this respect by inoculation, and that no deductions in support of this process can be drawn from this distribution.

From a study of these figures it would appear that the case for anti-typhoid inoculation is at present not a strong one, and before the real results of the process can be determined with any approach to satisfaction the effect of diseases of the para-typhoid type must be eliminated from the returns by careful diagnosis based on bacteriological processes. Although the correlation is not nearly as high as is usually found for the cases of "recovery from small-pox in the vaccinated," the general trend is to show a positive result in favour of the process, and this is particularly so in the examples where it is most reasonable to assume that one is dealing with true Typhoid Fever. Whether a polyvalent vaccine would be more efficacious or not, is a matter for the expert bacteriologist; but I feel convinced that so long as the para-typhoidal diseases are overlooked, either in the prophylactic treatment or in the statistics, more definite results will not be obtained. At present the statistics are not all that might be desired, but I understand that the Army authorities are making a special effort to obtain reliable figures in the future, and it is only from this source that we can hope to obtain sufficient data.

My excuse for presenting this paper at the present time in its admittedly incomplete form is the importance of the subject, not alone to the Military Authorities, but to all those living in the South African and other colonies, where Enteric Fever is a perennial scourge, which if regarded only from its financial aspect is a very serious question.

* The probable error in the Indian figures is calculated taking $N=7000$ as this was approximately the actual number from which the ratios were reduced. In the other cases $N=112$.

A BIOMETRIC STUDY OF PHAGOCYTOSIS WITH SPECIAL REFERENCE TO THE "OPSONIC INDEX."

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FIRST MEMOIR. ON THE FREQUENCY DISTRIBUTIONS OF PHAGOCYTIC COUNTS.

(*From the London Hospital Statistical Laboratory.*)

Perhaps no event since the famous studies of Metchnikoff has done so much to concentrate attention upon the phenomena associated with phagocytic action as the appearance of Wright and Douglas' papers announcing the discovery of "Opsonins" in blood serum*.

Since the original communications appeared, a literature of respectable dimensions has accumulated, and controversies, which show few signs of abating, have been provoked.

Looking at the matter from the standpoint of a clinician, it would appear that the controversialists are ranged in two camps. On the one hand, Sir Almroth Wright and his pupils maintain that we possess in the determination of the "opsonic index" not only a reliable means of diagnosis and prognosis in cases which cannot be elucidated by the time-honoured methods of clinical examination, but the ability to regulate therapeutic procedures with a precision and delicacy which, if still leaving somewhat to be desired, have been hitherto unattainable.

On the other hand, investigators not less numerous and almost as trenchant, have asserted that opsonic determinations are altogether unreliable for purposes of diagnosis, prognosis or treatment.

In view of the great practical value which must attach to the method if the claims of Sir Almroth Wright be well-founded, we have undertaken an analysis of data which seemed likely to yield information of importance as to the reliability of opsonic determinations as at present made.

* *Proc. Roy. Soc.* 1903, lxii. p. 357; 1904, lxiii. p. 728.

We do not think it necessary to examine in detail the various conflicting statements which have appeared, because we hope to show that:—(1) the problem is essentially a statistical one: (2) it is statistically complex and cannot be solved without such a preliminary analysis of the data as has, up to the present, not been attempted.

In order to establish these propositions to the satisfaction of a biometric reader, it will be necessary to describe in the fewest and simplest words the way in which an "opsonic index" is determined.

In consequence of Wright and Douglas' work, it is believed that the power of ingesting and rendering harmless foreign organisms—with which certain of the white blood cells, the phagocytes, are endowed—depends upon the presence in the tissue liquids, especially the blood plasma, of a substance certainly complex and probably specific, termed an "opsonin" (feast-preparer). This opsonin renders the foreign organism apt to be ingested and destroyed by a phagocyte. The difference between the phagocytic powers of a normal and a diseased person is due far more to differing amounts of opsonin in their respective tissue liquids than to differences in the phagocytic cells. Thus it is said that, with certain relatively unimportant exceptions, if A be normal and B diseased, B's leucocytes mixed with A's serum are as strongly phagocytic as A's own leucocytes in A's serum, and conversely.

If one wishes to determine the opsonic power of a man's blood with reference to, say, the tubercle bacillus, the following process is adopted*.

A sample of the patient's blood serum is taken, further a sample of normal corpuscles which have been washed free of adherent plasma, and an emulsion of dead tubercle bacilli; serum, corpuscles and bacillary emulsion being taken in equal parts. The three constituents are now mixed together and incubated at body temperature for a definite time. A second mixture is prepared and treated in the same way, except that normal serum (that generally of the operator, or a mixture of several presumably normal sera "pooled") is substituted for that of the patient.

Film preparations are then made from each mixture and so stained that the tubercle bacilli can be readily detected within or without the cells; with the ordinary technique, the red colour of the bacilli is well shown up against the blue nuclei and faintly blue cytoplasm of the leucocytes.

A variable number of leucocytes, in most laboratories neither less than 50 nor more than 100, is now counted on each of the two films and the number of bacilli per cell recorded. Let us suppose that the leucocytes mixed with the normal serum contained 100 bacteria in 50 cells, while those mixed with the patient's serum contained 50 bacteria in the same number of leucocytes, then the patient's opsonic index is said to be 50/100 or 0·5.

* The whole of our work is based upon determinations made relatively to the tubercle bacillus, and the phrase "opsonic index," when used without qualification, is to be understood as meaning opsonic index for tubercle. We are not prepared to say how far our conclusions are valid for other opsonic determinations.

This brief description is perhaps enough to establish the statements as to the essentially statistical nature of the problem advanced above. Since the fundamental point is whether and how far the character of the cells counted (a sample liable to the full error of random sampling) describes fairly that of the whole population of cells from which it is drawn, the question can only be adequately treated by a statistician. It is equally clear that the problem is complex because it involves several variables, no one of which is exactly known.

In the first place, the thickness of the bacillary emulsion, i.e. the number of bacilli per unit volume of emulsion, is necessarily different from day to day, because no satisfactory method of standardisation has yet been discovered. For instance, if on one occasion the emulsion contained a bacilli per unit volume, then it is impossible to insure that in subsequent determinations the emulsion will be of the same strength. Such variations are often large.

This difficulty is met by the assumption that if, with an emulsion of concentration a bacilli per unit, cells in normal serum ingest A bacilli per leucocyte and cells in pathological serum B bacilli per leucocyte, then with an emulsion of concentration $n.a$, the average cell contents will be respectively $k.A$ and $k.B$ where k is some constant.

It will be noticed that this assumption involves two distinct assertions, viz.:— (1) that the normal opsonic power is constant: (2) that given (1) nothing is changed relatively when the number of bacteria to be ingested is altered.

These questions have recently been discussed by Dr Alexander Fleming*, to whose statements we shall briefly refer.

In the first place, Dr Fleming cites the results of Dr Bulloch†, who estimated the indices of 84 apparently normal persons in terms of his own serum. 75 were between 0·9 and 1·1, the other 9 falling within the extreme limits of 1·2 and 0·8.

But a constant ratio, i.e. a constant opsonic index, would be found if the opsonic content of each serum varied from day to day in the same direction. The criticism is perhaps of little importance, but the point must be remembered.

A somewhat different process has been used in Sir Almroth Wright's laboratory and we quote Dr Fleming's description of it‡.

"In the routine work of the laboratory, the controls used in connection with the estimation of the tuberculo-opsonic indices of our patients are furnished by the various workers in the laboratory, or, it may be, by interested visitors and students, and these are used in the proportion of one control to every eight or ten patients' sera. Thus, in each day's work, there are three or four normal sera used, and each observer who engages in counting any of the slides, counts at least two, but even three or more of these controls.

* "Some Observations on the Opsonic Index with Special Reference to the Accuracy of the Method and to some of the Sources of Error" by Alexander Fleming (*Practitioner*, 1908, Vol. 80, pp. 607—634).

† W. Bulloch, *Trans. Path. Soc.* 1905, Vol. 56, p. 334.

‡ Fleming, *op. cit.* p. 608.

"In this way a double check on the accuracy of working is obtained, as not only is one control serum checked by the others, but one observer's count is at the same time checked by another's count of the same slide.

"The figures in the table represent the opsonic indices which are arrived at in exactly the same way as in dealing with a patient's blood, the actual phagocytic count of the slides being divided by the mean of the counts of all the controls counted."

Of 635 estimations made in this way 5 gave a reading of less than 0·9, 64 fell between 0·9 and 0·95; 488 were between 0·95 and 1·05, 68 between 1·05 and 1·1, and 10 were greater than 1·1.

We take this method to be superior to that employed by Dr Bulloch, since the "normal" mean value for any given day is deduced from more than one count made with more than one person's serum. We must, however, remark that the results to be described in this memoir seem to indicate a very considerable range of variation, whether the serum used be taken from a normal or diseased person, and that our work refers to much larger samples than those considered by either Dr Bulloch or by Dr Fleming.

Dr Fleming also considers various sources of error which, being dependent upon technical manipulations, hardly fall within our province, but it is right for us to summarise them as evidence of the complexity inherent in the opsonic problem from whatever standpoint it may be regarded.

(*a*) Agglutination of the washed *red* corpuscles increases the amount of phagocytosis, and the error thus introduced may be large*.

(*b*) If red corpuscles are taken up with the serum, the amount of phagocytosis is reduced.

(*c*) Blood capsules left widely open for several hours give untrustworthy readings.

We now turn to the actual counting of the cells, a vital matter, in respect of which Dr Fleming's views are so peculiar that we quote them *in extenso:*

"Having now discussed some points in connection with the different factors in connection with the estimation of the opsonic index, we turn to another most important part of the technique, namely the counting of the number of bacteria which have been ingested by the leucocytes. Needless to say, this must be done with great care and conscientiousness, otherwise errors will creep in. In this connection it should be pointed out that it is a great mistake to have any arbitrary number of leucocytes which one counts, neither counting more nor less whatever the conditions may be. A number of leucocytes, which will give one a good average of a slide with one emulsion, will not furnish a true estimate of a slide with another emulsion which may be uneven or clumpy. If all emulsions were perfect, it would be very easy to say that a certain number of leucocytes per slide would furnish a result differing from the true reading by not more than ten per cent., but, unfortunately, in practice emulsions are rarely perfect, and, as life is short, one wants to get a true estimate of the slide without counting very large numbers of leucocytes such as have been advocated in one or two quarters. It is here that experience will come in and enable a person, who counts intelligently, to obtain a good average with a smaller

* See Fleming, *op. cit.* p. 617.

number of cells than a beginner would require. If a person counts simply mechanically every leucocyte he meets and fails to bring any intelligence to bear on the subject in hand, however much care he may have taken to avoid error, if his emulsion is not perfectly even (which is uncommon), he will have to count a very much larger number of cells before he has a trustworthy count of the slide*."

Now the statement that, given a "perfect" emulsion, it would be easy to say that a certain number of cells would furnish a result within ten per cent. of the true reading, can only be valid if the nature of phagocytic frequency distributions were exactly known, i.e. whether such distributions are "normal" or "skew," and in the latter event, of what type and possessing what degree of skewness.

To the best of our knowledge, the present memoir contains the only attempt to answer these preliminary questions which has been made.

Again, why "intelligent" counting of a few cells should give better results than "mechanical" counting of many, is not obvious unless we are furnished with some stringent definition of the word "intelligent."

It is difficult for us to form a mental picture of a worker who, while failing "to bring any intelligence to bear on the subject in hand," *at the same time*, takes the greatest care to avoid error. We imagine that an intelligent worker, using the word intelligent in an ordinary way, will only reject cells so badly stained, broken up, massed together, or containing such clumps of bacteria that either the outline of the cell or the number of bacteria it contains cannot be accurately gauged.

Of papers expressing an unfavourable opinion of the opsonic method, the most extensive is that by Drs Strangeways and Whiteman and Miss Fitzgerald†.

These observers found very great differences between the means of phagocytic counts from batches of 50 or 100 cells taken from the same slide, i.e. mixed with the same serum. They also found that two capsules of the same blood, drawn at the same time and treated in the same manner, gave widely divergent readings. Similarly, opsonic indices of the same blood, estimated by different persons in terms of the same control, varied considerably.

The authors of the paper just mentioned did not avail themselves of modern statistical methods of analysis. Their conclusion that opsonic determinations are subject to an error of 100 per cent. does not, using the word error in any exact sense, follow from their work. There is, for instance, an evident confusion between the extreme variations in the range of values exhibited by the separate counts and the mean variation.

Further, a comparison of groups each of 100 cells from the same slide is not *necessarily* the same thing as comparing counts of 100 each from a separate slide. There is *possibly* here a fallacy analogous to that involved in the assertion that

* Fleming, *op. cit.* p. 627.

† "An Inquiry into the Value of the Opsonic Index" by M. P. Fitzgerald, R. I. Whiteman and T. S. P. Strangeways. (*Bulletin of the Committee for the Study of Special Diseases*, Vol. I. No. 8, Aug. 1907, Cambridge University Press.)

measuring the entire adult population of a village will give as good a measure of racial characters as a sample of the same number of persons drawn indiscriminately from a whole population.

Although we cannot satisfy ourselves that Dr Strangeways and his colleagues have demonstrated that the opsonic method is unsound, their paper marked, in our opinion, an important step in advance. They were, we think, the first students of the method to realise the necessity of counting large numbers of cells, in some cases extending their counts to 2000 cells, and to attempt to put the matter upon an adequate statistical or arithmetical basis.

Should the present memoir be of any service to subsequent investigators, it will be owing to the kindness of Dr Strangeways, who has placed all his valuable material at our disposal. No useful purpose would be served by a further attempt to summarise the literature of opsonic determinations*. To do so would entail the recitation of absolutely irreconcilable conclusions, based, so far as we can judge, upon but slender evidence.

The accounts to which we have more particularly referred, ably present the opinions of two schools of observers, and will enable the statistician "to see the cloud of doubt in which things are wrapped." We shall now describe the manner in which we have attempted to elucidate the points at issue.

The practical man has a right to demand that a biometric problem should first be attacked in the most simple and direct manner. Only when simple methods are demonstrably insufficient are we justified in adopting a more elaborate and less direct plan.

The most direct way to test the value of opsonic determinations is to compare the differences between the mean of a "control" phagocytic count and the respective means of patients' counts, made on the same day and with the use of the same emulsion, with the probable errors of such differences calculated *on the assumption of a normal distribution of the observations.* It could then be seen whether the indices corresponded to significant differences of mean values.

Now, at the London Hospital, one or two control counts of 75 cells which have been in contact with the serum of the investigator, serve as a standard by which other counts, each of 75, made on the same day are measured.

The actual figures having been preserved, numerous series were available for analysis, thanks to the kindness of our colleague, Dr Western.

Assuming the normality of the distributions, results were obtained, a few of which are reproduced in Table I.

At first sight these results suggest that variations of say $\pm$ 20 per cent. in the mean value, or opsonic indices above 1·2 or below 0·8, are significant were it not for the existence of a striking peculiarity.

* Reference may be had to Manwaring and Ruh, *Journ. of Experimental Medicine*, Vol. IX. 1907, p. 473. C. E. Simon, *ibid.* p. 487. C. F. Bolduan, *Long Island Medical Journal*, Vol. I. 1907, No. 10 and *Medical Record*, Jan. 4, 1908.

TABLE I.

Figures from London Hospital tested on Basis of Normal Distribution.

5 xi. 07. "Control" Mean 2·053 ± ·1093.

Expt. No.	(1) Mean Bacilli	(2) Difference Δ from "Control" Mean	(3) Opsonic Index	(4) Δ/E *
2	1·33	·72 ± ·16	0·65	4·50
3	2·21	·16 ± ·16	1·08	1·02
5	2·57	·52 ± ·18	1·25	2·89
7	2·27	·21 ± ·16	1·10	1·31
11	1·95	·10 ± ·16	0·95	0·63
		2 xi. 07. "Control" Mean 3·453 ± ·0324.		
4	4·05	+ ·60 ± ·25	1·17	2·43
5	3·43	− ·02 ± ·22	0·99	0·09
6	3·95	+ ·50 ± ·25	1·14	2·00
7	3·07	− ·38 ± ·24	0·89	1·58
10	4·71	+1·26 ± ·25	1·36	5·04
11	3·48	+ ·03 ± ·24	1·01	0·13
12	3·63	+ ·18 ± ·24	1·05	0·75
13	3·43	− ·02 ± ·24	0·99	0·08

No statistician glancing at the figures could help being struck by the apparent skewness of the distributions.

We give in Table II. four examples taken at random.

TABLE II.

Four Examples of Phagocytic Counts from London Hospital Records.

Number of Bacilli per cell	Frequency of Cells			
	1	*2*	*3*	*4*
0	3	5	9	2
1	15	4	18	3
2	22	7	18	9
3	26	15	23	11
4	23	16	31	11
5	25	13	21	14
6	17	7	10	9
7	5	2	10	9
8	9	4	3	3
9	5	1	5	3
10	0	1	2	1
11	0	0	0	0
12	0	0	0	0
Totals	150	75	150	75

* E = probable error of Δ.

While an analysis of counts of 75 would not enable us to settle the type distribution, yet in the face of such figures it is not justifiable to assume that the distributions are normal.

But if the distribution of the variates round the mean of a sample is not Gaussian, then to assume that the curve representing the locus of means obtained from such samples is normal, and to use the ordinary notation for "probable errors," would be equally unjustifiable.

In discussing a kindred subject in a recent number of this journal*, Pearson remarks—"A further point not yet discussed, but of some importance, is the significance of the 'probable error' at all when we are taking the standard deviation of standard deviations in the case of very skew material. How far does the distribution of standard deviations follow a normal curve?"

In a valuable memoir†, "Student" has investigated the distribution of the means of small samples derived from a normal population, and has shown that such distribution is not Gaussian. The problem has not yet, we think, been studied in the case of skew material. Theoretically it is difficult because the analysis becomes troublesome when we have to deal with a case in which, among other things, the odd moments do not vanish; the problem is nevertheless of such importance that we hope to publish later some theoretical considerations.

However this may be, whether we can determine the curve of means with the help of algebraic analysis alone, or whether we are compelled to fall back on directly empirical methods, an essential preliminary is a knowledge of the frequency distributions of phagocytic cells with respect to the number of bacteria contained in them, as determined on statistically adequate samples of the material from which the small working-samples are extracted. When we have this knowledge, the question as to whether the opsonic method be worthy of confidence will be, not solved, but capable of solution.

We hope that this vital point will be clear to the non-statistical reader. Briefly recapitulating—The reliability of the opsonic method turns on whether the mean of the sample measured with the control serum, and the mean of the sample measured with the patient's serum represent adequately the values which would be obtained if a very large number of cells had been counted in each case. We require some measure of the variation in each mean value which may be considered to depend, not upon technical errors, but upon the fact that only a small sample of the population is examined. Until this question is settled, manipulation of the ratios of the means of samples (i.e. opsonic indices) does not seem to be desirable. Such statistical tests as are ordinarily applied to the cases of small random samples are based on assumptions which, in this instance, are arbitrary.

We shall therefore first investigate the frequency distributions of phagocytic cells with respect to the content of tubercle bacilli, determined by the analysis of

* *Biometrika*, Vol. VI. p. 117.

† *Biometrika*, Vol. VI. pp. 1—25.

many distributions, including in each case never less than 400, and in the majority 1000 cells.

Having examined the results thus obtained, we shall give an illustration of the fitting of a curve to the means of samples, each of 25, drawn from a continuous count of 2000 cells, reserving a more complete study of this branch of the subject for a second memoir. Finally, we shall indicate the preliminary conclusions which may be drawn from our work.

The material upon which our analysis is based is two-fold.

As we mentioned above, Dr Strangeways allowed us to use all his data, and from this rich material we have obtained 8 sets of 1000 cells each, and one count of 2000.

In addition, Dr Fleming, at the suggestion of Sir Almroth Wright*, who expressed his willingness to allow material from his laboratory to be submitted to statistical investigation, made for us six counts, the numbers of cells included varying from 400 to 1100. The frequency distributions are given in Table III. *bis*, and the means of the two sets of figures are as follows:—

TABLE III.

Observer	Reference	Number of cells	Mean	Number of graph
Strangeways	I	1000	1·927	1
,,	II S. C.	,,	1·521	2
,,	II C. & S.	,,	1·888	3
,,	IV	,,	1·706	4
,,	III	,,	2·014	5
,,	V	,,	2·119	6
,,	VII	,,	1·851	7
,,	VI	,,	1·901	8
,,	IV	2000	1·689	9
Fleming	T. C.	1000	2·145	10
,,	10 Norm.	1010	2·571	11
,,	Norm. S. A.	750	3·040	12
,,	No. 2	800	2·0825	13
,,	T. A.	1100	3·729	14
,,	Norm. S. B.	400	3·005	15

A striking difference between the S. and F. counts is the higher mean value found in all the latter.

Owing to the greater ease of counting when but few bacilli are present in each cell, it was formerly recommended that an emulsion should be used which would give about 1·5 bacilli per cell as a mean when normal serum was employed.

* We desire to express our gratitude to Sir Almroth Wright for allowing the counts to be made and to Dr Fleming for the care and labour entailed in making them.

TABLE III *bis*.

Frequency Distributions.

Bacilli per cell.

Observer	Key Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Strangeways	I	219	267	219	129	70	50	26	13	5	2	—	—	—	—	—	—	—
"	II S. C.	279	313	192	115	62	20	8	7	2	2	—	—	—	—	—	—	—
"	II C. & S.	198	305	220	124	81	31	17	13	4	5	1	—	1	—	—	—	—
"	IV S. C.	243	290	220	134	54	26	15	9	6	3	—	—	—	—	—	—	—
"	III	188	261	226	153	92	44	19	10	2	3	—	—	1	—	—	1	—
"	V	192	248	202	165	95	47	21	19	4	5	1	1	—	—	—	—	—
"	VII	240	251	212	150	70	38	23	12	2	2	—	—	—	—	—	—	—
"	VI	207	263	223	153	87	35	21	6	3	2	—	—	—	—	—	—	—
"	IV	495	571	445	255	124	55	27	13	9	4	2	—	—	—	—	—	—
Fleming	T. C.	152	239	262	159	96	54	22	11	4	—	1	—	—	—	—	—	—
"	10 Norm.	111	218	210	189	144	73	35	11	11	4	4	—	—	—	—	—	—
"	N. S. A.	41	126	154	164	121	62	36	35	5	2	3	1	—	—	—	—	—
"	No. 2	99	227	208	134	78	34	9	7	3	—	—	—	1	—	—	—	—
"	T. A.	58	107	203	207	174	138	90	49	31	19	10	4	4	1	2	1	2
"	N. S. B.	19	59	98	88	65	37	17	8	5	2	1	—	1	—	—	—	—

Dr Strangeways and his colleagues adopted this plan. As we desired to study the effect on the distributions of raising the mean value, Dr Fleming, at our request, worked with emulsions thicker than those generally employed, so that the effect of the change could, to some extent, be gauged.

We have used the customary method of moments and fitted the curves indicated by the value of κ_2 for each distribution.

Since the actual distributions did not point to high contact at both ends of the range we have not felt justified in applying Sheppard's corrections, and have in all cases worked with raw moments.

Table IV. includes the principal constants for each distribution, together with the values of P*. Table V. contains the equation of each curve, and Graphs 1—15 give the fitted frequency-curves for each worker's material.

We shall first consider Dr Strangeways' *data*.

Before referring to details, however, we desire to point out the completeness with which our results justify the use of Pearson's type curves for biological material of this class. We are now speaking to the practical man with no special knowledge of statistical theory. For him, the real justification of a statistical method must be its capacity adequately to describe samples of material.

This point may be emphasized by reference to a criticism of the methods employed by biometricians.

* The non-statistical may regard P as a measure of agreement between theory and experiment, the value lying between 1, which marks absolute harmony, and 0. See Pearson, *Philosophical Magazine*, 1900, Vol. 58, p. 175. Elderton, *Biometrika*, 1902, Vol. I. p. 156.

TABLE IV.

Constants of Curves of Type I.

Name	Key Number	Number of cells	Mean	Mode	σ	β_1	β_2	κ_2	m_1	m_2	a_1	a_2	β_2-3	*Sk.*	*P*
Strangeways	I	1000	1·927	·2483	1·7370	1·1996	4·0367	– ·7759	·2250	5·0017	·5715	12·7037	1·0367	·9667	·8345
,,	II S. C.	1000	1·521	·3961	1·4885	1·7839	5·4307	– 3·9486	·7283	29·6566	·9176	37·3466	2·4307	·7557	·8368
,,	II C. & S.	1000	1·888	·5763	1·7209	2·1776	6·1928	– 17·1440	·7182	120·2418	·9692	162·2571	3·1928	·7622	·6900
,,	IV	1000	1·706	·4004	1·6086	1·9095	5·5471	– 3·3407	·5312	22·4231	·7902	33·3574	2·5471	·8117	·4178
,,	V	1000	2·119	·9096	1·8207	1·2561	4·5874	– 2·0896	1·0937	20·4840	1·6084	30·1228	1·5874	·6643	·6415
,,	VI	1000	1·901	·9051	1·6091	·9557	4·0623	– ·1199	1·2262	13·7977	1·6537	18·6085	1·0623	·6316	·9584
,,	VII	1000	1·851	·5301	1·6730	1·0993	4·0562	– ·8929	·5509	7·3527	1·0594	14·1413	1·0562	·7896	·6175
,,	IV	2000	1·689	·5666	1·5825	1·7977	5·5790	– 8·3130	·9593	68·0135	1·1397	80·8012	2·5790	·7093	·6850
,,	IV	80 means	1·691	1·5400	·3278	·4756	3·3185	– ·5073	1·9394	10·0627	4·1977	21·7805	·3185	·4597	·9190
Fleming	T. Chor.	1000	2·145	1·2477	1·6401	·7878	3·8580	– 1·0948	1·6580	15·5284	2·0578	19·2729	·8580	·5471	·8350
,,	10 Norm.	1010	2·571	1·7027	1·8448	·7626	4·0164	– 2·6733	2·8984	48·1737	2·9510	49·0480	1·0164	·4708	·4249
,,	Norm. S. A.	750	3·040	2·2099	1·8927	·5689	3·6214	– 1·0520	2·5978	21·9556	2·9578	24·9981	·6214	·4385	·0314

Constants of Curves of Type V.

Name	Key Number	Number of cells	Mean	Mode	σ	β_1	β_2	κ_2	p	γ	β_2-3	*Sk.*	*P*
Strangeways	III	1000	2·014	1·1697	1·7239	2·0366	7·6447	·7416	12·7535	57·8953	4·6447	·4898	·6004
Fleming	No. 2	800	2·0825	1·4134	1·5397	1·2664	5·6386	·8523	17·5656	91·4681	2·6386	·4345	·8721
,,	T. A.	1100	3·7291	2·7096	2·3820	1·2019	5·3331	1·1097	18·2469	151·1134	2·3331	·4280	·7631
,,	Norm. S.B.	400	3·005	2·2806	2·8207	0·9540	4·8445	1·0747	21·7178	155·3138	1·8445	·3984	·9998

Professor Bruns, in his work on the Theory of Probability, writes:—

"Es ist nämlich leicht zu übersehen, dass die von uns zugrunde gelegte erweiterte Begriffsbestimmung der K.-G. die ja auch willkürlich ersonnene Reihe zülasst, von vornherein eine andere analytische Behandlung der Funktionen $\mathfrak{S}$ und $\mathfrak{B}$ verlangt. Denn wenn als Verteilungskurve ein vorläufig beliebig gestalteter Linienzug auftreten kann, so ist nicht daran zu denken, dass sich solche Gebilde allgemein einer einfacher Formel unterwerfen lassen. Aus diesem Grund sind für unsere Aufgabe auch die von Pearson angegebenen Formen...unzureichend, obgleich sie in mathematischer Beziehung eine grössere Biegsamkeit besitzen, als das zweiseitige Gesetz (Fechner)*."

A sufficient answer to Professor Bruns is that the skew curves of Pearson describe, and describe well, variation in material from many different sources; of this nearly all the examples obtained in the present research afford a striking illustration. Anyone who takes the trouble to examine the method which Professor Bruns holds (erroneously, as we think) to be theoretically superior, will not need to be told that the generalised curves of Pearson are easier to work within statistical practice. If then they give, as here, admirable results, their superiority cannot be questioned.

Turning to the details, we see that all the S. counts, except III., are examples of Type I. with marked skewness. We also notice, as would be expected†, that the most extreme skewness occurs in the distribution of least range.

It may be remarked that the negative start‡ of the curves (see especially Graphs 5 of Strangeways, 11, 13, 14 and 15 of Fleming) may well have some biological significance. We believe that those who have studied the mechanism by the agency of which foreign particles enter or are brought within amœboid cells, are by no means clear as to its real nature§.

It is not clear that all the cells containing no bacteria represent the same stage of phagocytic power. It will perhaps seem that a true interpretation of phagocytic counts having a large number of leucocytes with zero frequency of ingested bacilli is only possible on the basis of some such analysis as the present. The matter is, however, too conjectural for us to consider it here.

The only exceptional result among the S. data was obtained from III. Here the value of the second criterion required, strictly speaking, a curve of Type IV. Type IV. constants were calculated, but although the curve was a good graphical fit, the value of P was small mainly owing to a want of agreement in the first group. In view of the fact that κ_2 was tolerably close to unity we also tried Type V., and, as will be seen, the result is good, and brings this count into line

* *Wahrscheinlichkeitsrechnung und Kollektivmasslehre*, von H. Bruns, Leipzig, 1906, p. 111.

† Pearson and Filon, *Phil. Trans.* A. Vol. 191, pp. 282, etc.

‡ The start should not of course be before $-\cdot5$, the large probable error of range gives little significance to starts even at -1. The technique, however, of Sir A. Wright's laboratory appears to emphasise the extent of negative range.

§ For a readable summary with bibliography, see Weiss, Nagel's *Handbuch der Physiologie des Menschen*, Bd. IV. 1908, pp. 629—665.

with the other examples. It is specially to be borne in mind that the change of type occurs at the highest mean value of the series. The interest of this will be clear when we have examined the distributions of Dr Fleming's counts.

Just as before, we find the distributions for Dr Fleming's counts are excellent examples of skew variation, and, with one exception (Norm. S.A.), the fits are good, the values of P being but little inferior to those obtained for the S. counts.

The exception (N.S.A.) is, we think, more apparent than real. The graph is a very fair fit, and one group has been mainly influential on P, adding more than 10 to χ^2. There appears to be definite evidence of anomaly in the group of cells with 7 bacilli.

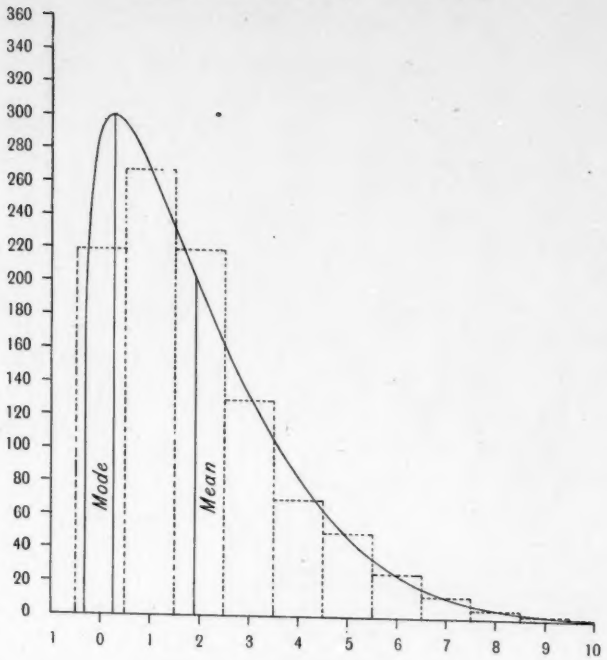
The mean of this count was high, and the sensible frequencies extended to 9 and 10 bacilli per cell. It is notoriously difficult accurately to determine the

TABLE V.

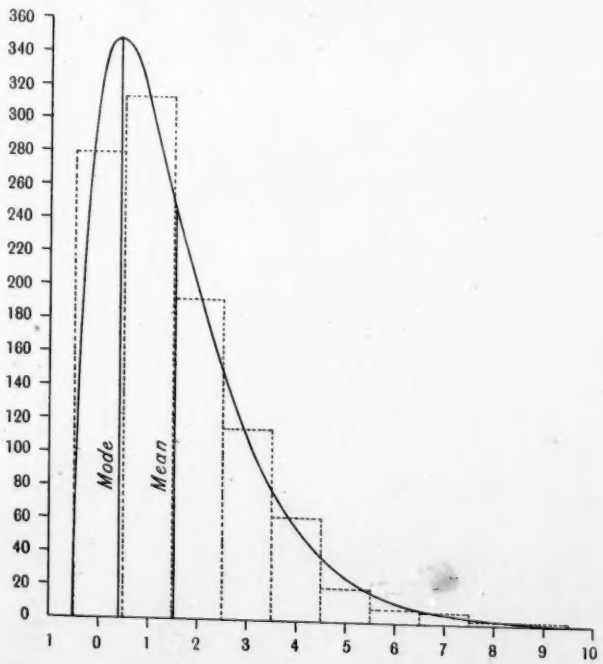
Equations to Curves.

Strangeways:		Graph No.
I	$y = 299{\cdot}93816\left[1+\frac{x}{{\cdot}5715}\right]^{{\cdot}2250}\left[1-\frac{x}{12{\cdot}7037}\right]^{5{\cdot}0017}$.	1
II S. C.	$y = 348{\cdot}0489\left[1+\frac{x}{{\cdot}9176}\right]^{{\cdot}7283}\left[1-\frac{x}{37{\cdot}3466}\right]^{29{\cdot}6566}$.	2
II C. & S.	$y = 315{\cdot}83835\left[1+\frac{x}{{\cdot}9692}\right]^{{\cdot}7182}\left[1-\frac{x}{162{\cdot}2571}\right]^{120{\cdot}2418}$.	3
III	$y = \text{antilog } 16{\cdot}3831727 \times x^{-12{\cdot}7535} \times e^{-57{\cdot}8953/x}$.	5
IV	$y = 335{\cdot}8664\left[1+\frac{x}{{\cdot}7902}\right]^{{\cdot}5312}\left[1-\frac{x}{33{\cdot}3574}\right]^{22{\cdot}4231}$.	4
V	$y = 258{\cdot}7307\left[1+\frac{x}{1{\cdot}6084}\right]^{1{\cdot}0037}\left[1-\frac{x}{30{\cdot}1228}\right]^{20{\cdot}4840}$.	6
VI	$y = 278{\cdot}51616\left[1+\frac{x}{1{\cdot}6537}\right]^{1{\cdot}2202}\left[1-\frac{x}{18{\cdot}6085}\right]^{13{\cdot}7977}$.	8
VII	$y = 284{\cdot}2268\left[1+\frac{x}{1{\cdot}0594}\right]^{{\cdot}5509}\left[1-\frac{x}{14{\cdot}1413}\right]^{7{\cdot}3527}$.	7
IV 2000	$y = 643{\cdot}9147\left[1+\frac{x}{1{\cdot}1397}\right]^{{\cdot}9593}\left[1-\frac{x}{80{\cdot}8012}\right]^{68{\cdot}0135}$.	9
Fleming:		
T. C.	$y = 264{\cdot}7097\left[1+\frac{x}{2{\cdot}0578}\right]^{1{\cdot}6580}\left[1-\frac{x}{19{\cdot}2729}\right]^{15{\cdot}5284}$.	10
10 Norm.	$y = 237{\cdot}05324\left[1+\frac{x}{2{\cdot}9510}\right]^{2{\cdot}5984}\left[1-\frac{x}{49{\cdot}0480}\right]^{48{\cdot}1737}$.	11
N.S.A.	$y = 173{\cdot}91942\left[1+\frac{x}{2{\cdot}9578}\right]^{2{\cdot}5978}\left[1-\frac{x}{24{\cdot}9981}\right]^{21{\cdot}9556}$.	12
N.S.B.	$y = \text{antilog } 29{\cdot}9855876\, x^{-21{\cdot}7173}\, e^{-155{\cdot}3138/x}$.	15
No. 2.	$y = \text{antilog } 22{\cdot}603153 \times x^{-17{\cdot}5656} \times e^{-91{\cdot}4681/x}$.	13
T.A.	$y = \text{antilog } 27{\cdot}0100681 \times x^{-13{\cdot}2469} \times e^{151{\cdot}1134/x}$.	14

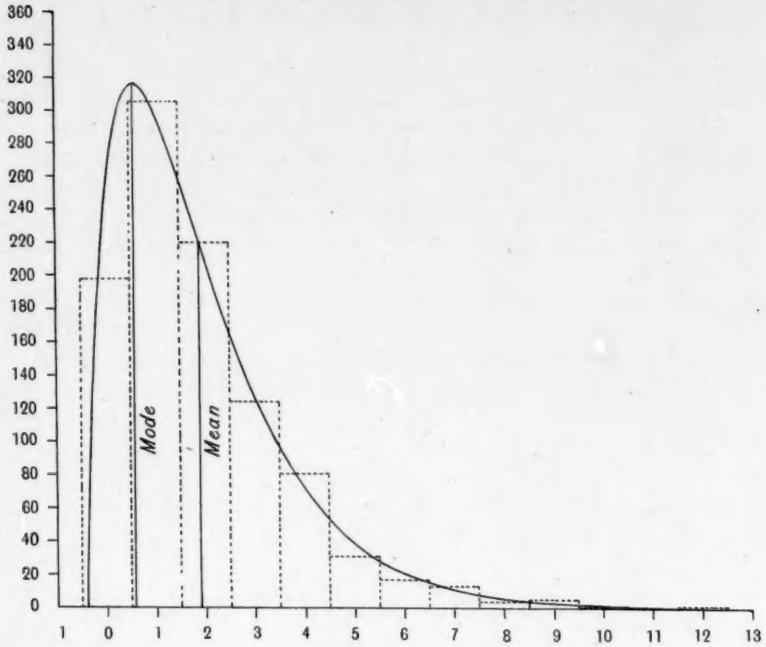
GRAPH 1. Strangeways, T. S. P. I (Slide 7).



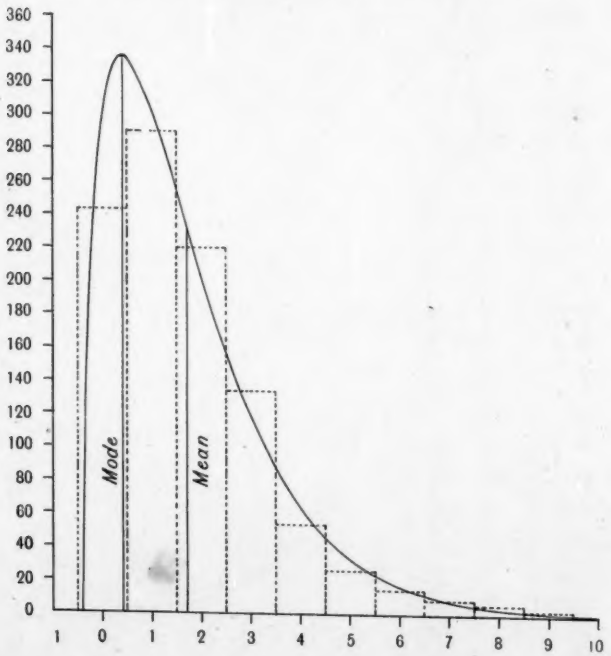
GRAPH 2. Strangeways, Slide II. S. C.



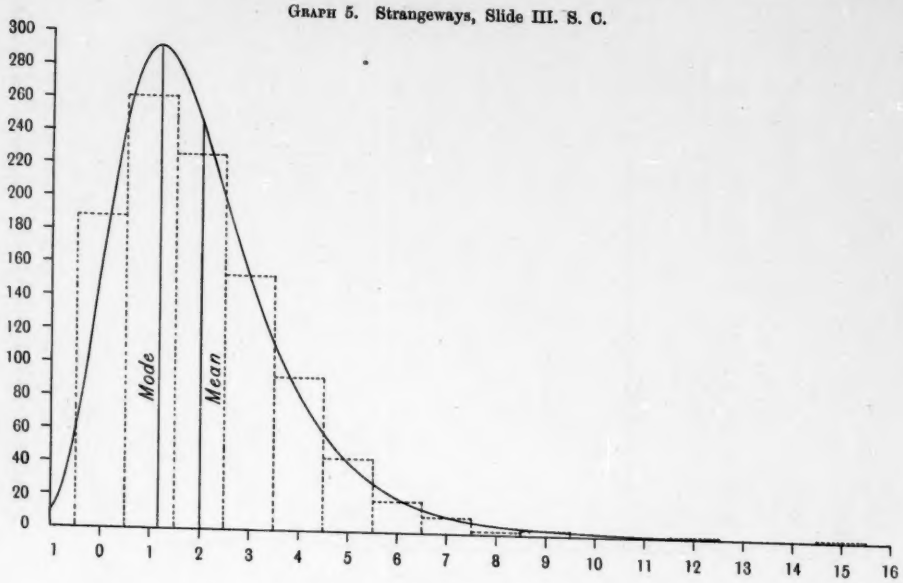
GRAPH 3. Strangeways, Slide II. 1st 1000, C. and S.



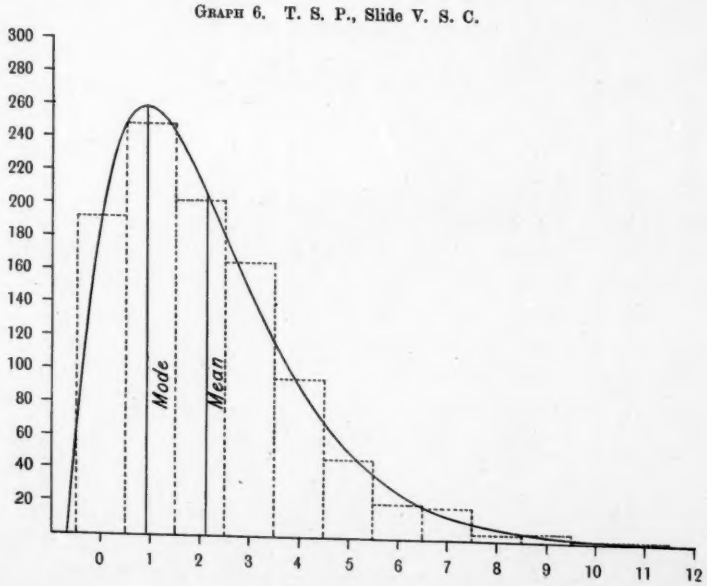
GRAPH 4. Strangeways, IV. S. C. (T. S. P. IV).



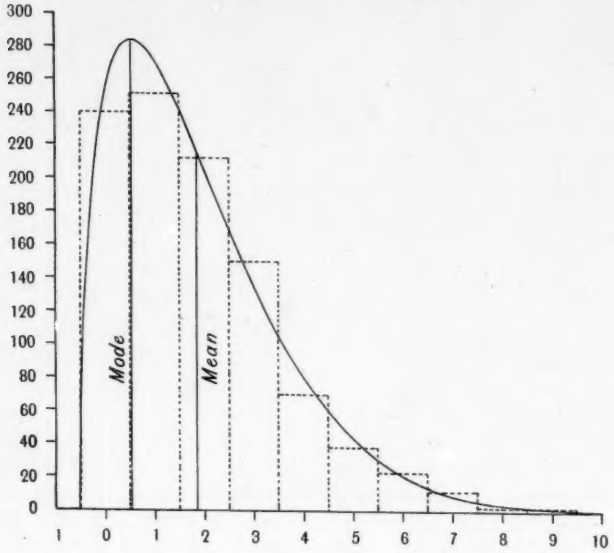
GRAPH 5. Strangeways, Slide III. S. C.



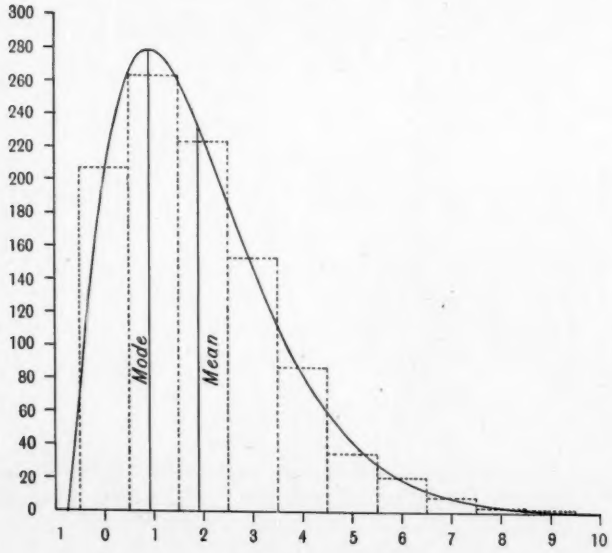
GRAPH 6. T. S. P., Slide V. S. C.



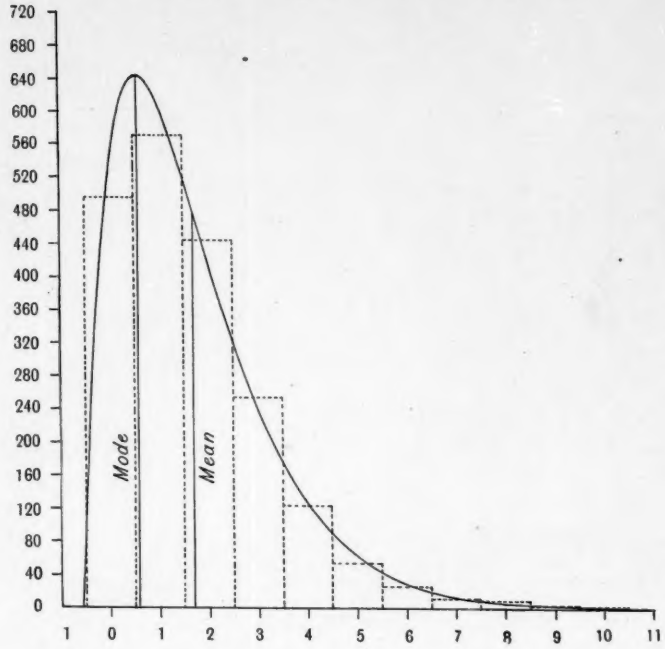
GRAPH 7. Strangeways, T. S. P., Slide VII. S. C.



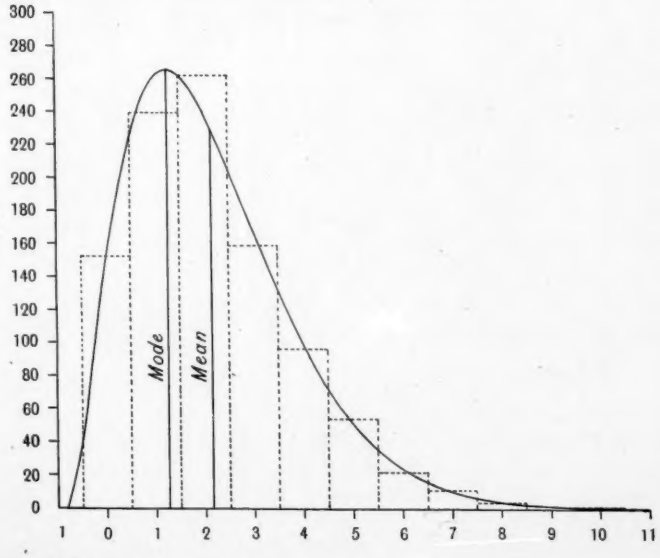
GRAPH 8. Strangeways, T. S. P. VI.



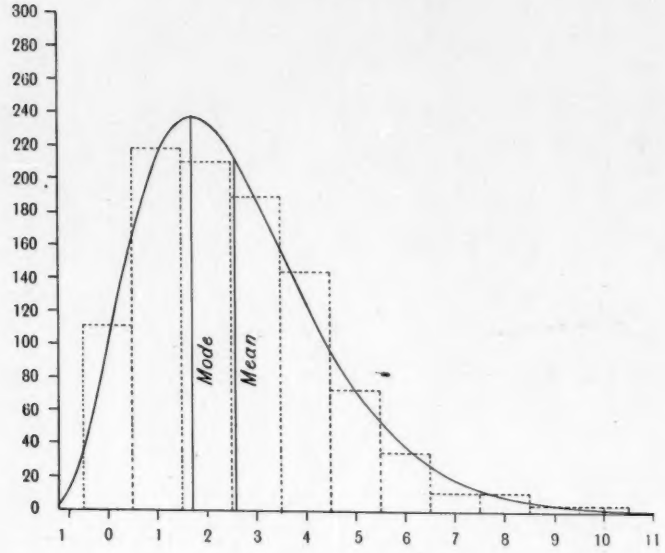
GRAPH 9. Strangeways, T. S. P. IV. (2000 cells).



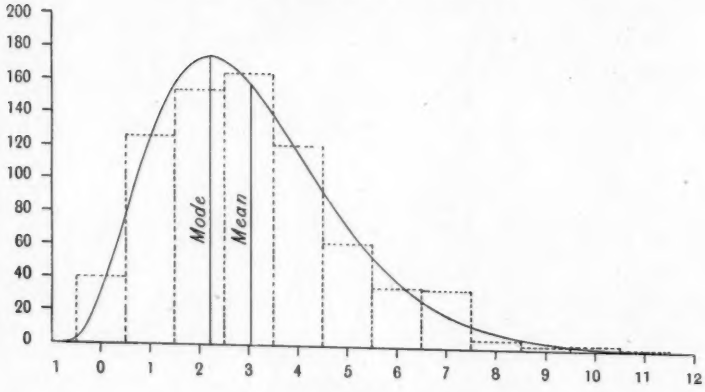
GRAPH 10. Fleming, Tuber. Choroiditis.



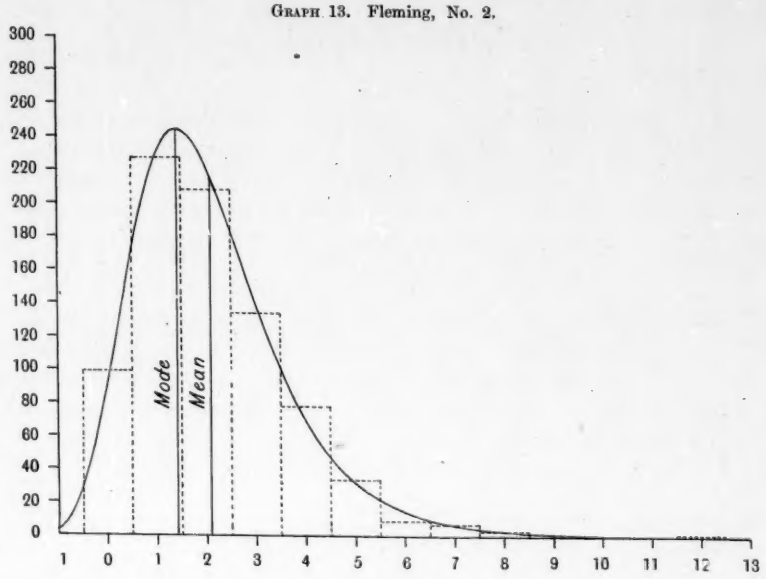
GRAPH 11. Fleming, No. 10. Normal.



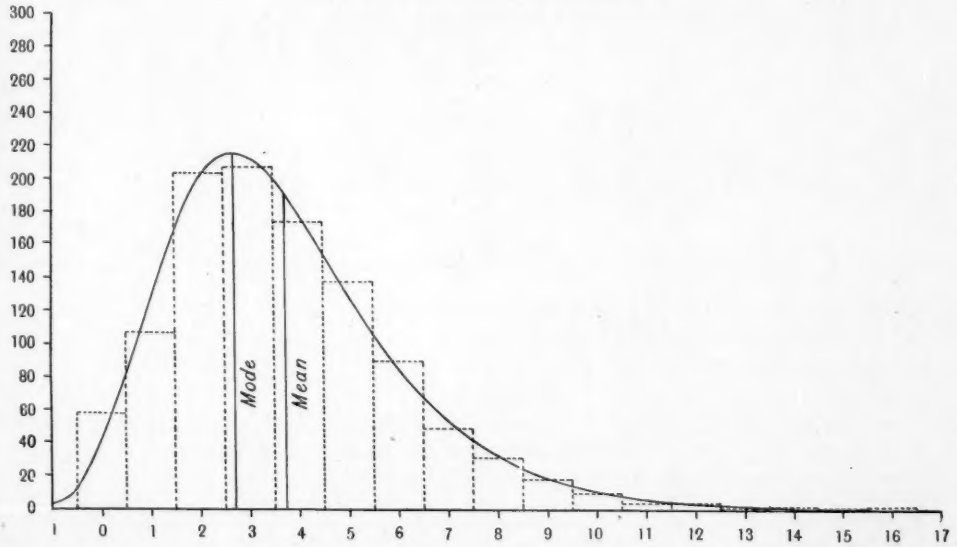
GRAPH 12. Fleming, Normal Serum A.



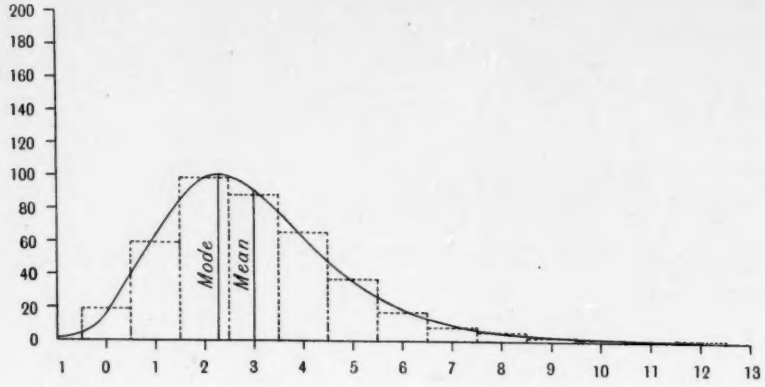
GRAPH 13. Fleming, No. 2.



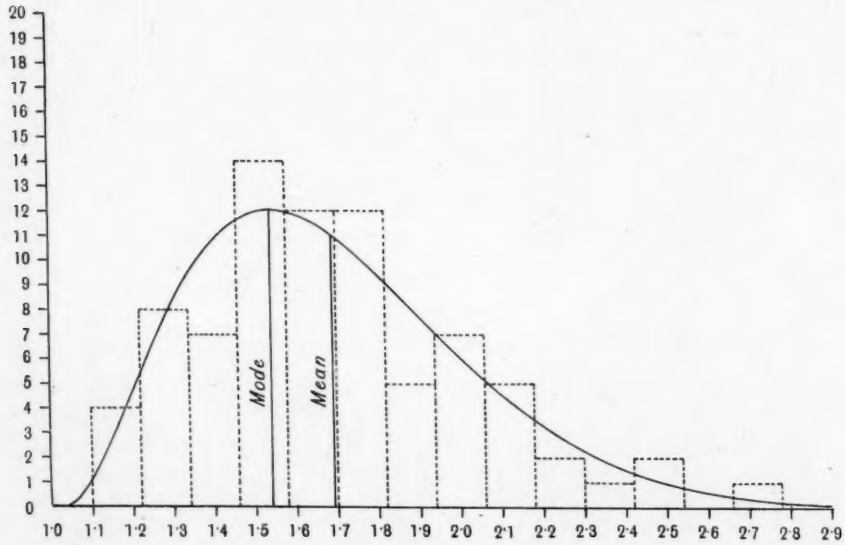
GRAPH 14. Fleming, Tuberculous Arthritis I.



GRAPH 15. Fleming, Normal Serum. Slide B.



GRAPH 16. (S. IV). Curve of (80) Means.



number of bacilli in a leucocyte when the number is large, and this may well account for the irregularity seen at the upper end of the scale where the theoretical curve (Graph 12) gives an obviously more probable distribution than the observed result.

It will be noticed that, in the F. material, Type V. occurs as often as Type I. and is, in all but one case, associated with a high mean value. The *marked* fall of skewness in this set is also of much importance.

Having now presented the main results of our frequency analyses, we are in a position to scrutinise them more closely, touching on certain questions to which they give rise.

First, is our material homogeneous, and does it exhibit nomic variation?

In view of the size of the counts it is reasonable, even without direct calculation, to think that, with the possible exception of N.S.B., the frequency constants are statistically significant. This granted, it is clear that the variation is not only nomic, but of a definite order. Table VI. contains the constants of importance in testing for Gaussian distribution, and it cannot be doubted that random sampling of a Gaussian population could not possibly yield such values.

TABLE VI.

Tests for Normality of Distribution.

Reference Number	$\sqrt{\beta_1}$	$\beta_2 - 3$	Skewness	Modal Divergence
S. I (S. C.)	1·0953 ± ·0522	1·0368 ± ·1045	·9667 ± ·0261	1·6787 ± ·0454
S. II (S. C.)	1·3356 ± „	2·4306 ± „	·7557 ± „	1·1250 ± ·0389
S. II (S. & C.)	1·4757 ± „	3·1928 ± „	·7622 ± „	1·3117 ± ·0450
S. III	1·4271 ± „	4·6447 ± „	·4898 ± „	·8443 ± ·0450
S. IV	1·3818 ± „	2·7516 ± „	·8117 ± „	1·3060 ± ·0420
S. VI	·9776 ± „	1·0623 ± „	·6316 ± „	·9959 ± ·0420
S. VII	1·0485 ± „	1·0562 ± „	·7896 ± „	1·3199 ± ·0440
S. IV (2000)	1·3408 ± ·0369	2·5790 ± ·0739	·7093 ± ·0185	1·1224 ± ·0292
F. N. S. A.	·7542 ± ·0603	·6214 ± ·1207	·4385 ± ·0302	·9301 ± ·0571
F. No. 2	1·1253 ± ·0584	2·6386 ± ·1168	·4345 ± ·0292	·6691 ± ·0450
F. 10 Norm.	·8732 ± ·0520	1·0164 ± ·1040	·4708 ± ·0260	·8686 ± ·0479
F. Tub. Chor.	·8876 ± ·0523	·8580 ± ·1045	·5471 ± ·0261	·8973 ± ·0438
F. Tub. Arth. 1	1·0963 ± ·0498	2·3331 ± ·0996	·4280 ± ·0249	1·0194 ± ·0593

It can of course be said that the description of material by a unimodal frequency curve does not preclude the possibility of its being heterogeneous. Thus a mixture of two or more homogeneous distributions *might*, if the respective modes were close together, be described by a skew frequency curve.

That, with such totals as one or two thousand, we should under these conditions obtain the fits shown, hardly seems sufficiently probable to need investigation here*. We have at least established something more than a *prima facie* case

* It may further be remarked that the rise at a finite angle at the start of the range in nearly all the curves in itself precluded any possibility of a heterogeneity compounded of Gaussian distributions.

for homogeneity. Secondly, admitting the two sets of frequencies to be definite examples of skew variations of the types indicated, is there any distinct character marking one set off from the other? This question is evidently one of much theoretical and practical interest, and we cannot at present furnish an answer which is entirely satisfactory.

We have already remarked on the great diminution in skewness exhibited by the F. material as compared with the S. counts. Although some reduction might be anticipated in view of the higher modal values, which latter are in some measure dependent on experimental conditions (vid. sup. p. 384), we are not clear that this is a complete answer. To determine whether, by random sampling, such a reduction in skewness as we have found would be accounted for adequately by the change in modal value is not easy for the types involved. We have, however, applied a less satisfactory but somewhat easier test.

It was noticed that, although the second moments of the F. distributions were larger than for the S. counts, the increase was not proportional to the mean values. This will be apparent from Table VII., which gives the coefficients of variation.

TABLE VII.

Coefficients of Variation.*

Strangeways :	I	90·14	Fleming :	Tub. Chor.	76·46
,,	II S. C.	97·86	,,	10 Norm.	60·08
,,	III	85·60	,,	Norm. S. A.	62·26
,,	II S. & C.	91·15	,,	No. 2	73·94
,,	IV	94·29	,,	T. A.	63·88
,,	V	85·92	,,	N. S. B.	60·59
,,	VI	84·64			
,,	VII	90·38			
,,	IV (2000)	93·69			

Now it is well known that $r_{h\mu_2} = \dfrac{\mu_2}{n\sigma_h \sigma_{\mu_2}}$

when $r_{h\mu_2}$ is the correlation between mean and second moment, and σ_h, σ_{μ_2} the standard deviations of mean and second moment respectively.

If therefore we calculate σ_h and σ_{μ_2} on the basis of the count of 2000 cells (S. IV 2000), we can form some idea as to whether the observed values of μ_2 for the other counts are such as we should expect, with random sampling, to be associated with the observed values of the mean.

The regression of μ_2 on h was assumed to be linear and the probable value of μ_2 was calculated for 7 S. counts and the results tested for goodness of fit. P was greater than ·99.

The same process applied to 5 F. counts gave $P < ·0004$.

* It need scarcely be remarked that no stress is or can be laid on the actual values of the coefficients since Mean and Coefficient of Variation are negatively correlated. The table merely illustrates the tendency discussed in the text.

Too much weight must not be assigned to this result, but the indication undoubtedly is that the Strangeways counts are more truly random samples, and therefore better measures of the phagocytic "population" than those of Dr Fleming.

While the evidence undoubtedly points to the conclusion that the difference between the F. and S. series is not wholly to be accounted for by the increased thickness of emulsion employed for the former counts, we are not prepared to assert that the foregoing analysis is sufficient to render the conclusion certain, and we hope to deal with the matter on a subsequent occasion. For these reasons it would not be profitable to discuss the question as to how far differences in technique might operate in depriving a count of its character as a random sample. In justice to Dr Strangeways and his co-workers, however, we must point out that the indirect attacks which have been made* on their competency as observers of phagocytic distributions are entirely unsupported by our investigations. We see no reason whatever for refusing to assign at least equal degrees of importance to the S. data and to those of Dr Fleming.

Gathering up our results, do we find that they affect one's estimate of the practical value of the opsonic test?

One thing is certain; it is not proper to test the distribution either of means or opsonic indices on the basis of a normal population. The population is pronouncedly skew. In view of the extreme skewness of these phagocytic distributions, the mode would be a far better constant for the determination of the opsonic index than the mean; the latter's physical significance has no longer the value attaching to it in the case of normal distributions.

At one time we had a hope† that this skewness, so accentuated in Dr Strangeways' counts of low mean value, might disappear with Dr Fleming's counts, which were rendered higher by the use of a thicker bacillary emulsion; we surmised that the consequent increase in mean and modal values would be associated with an approach to symmetry which might justify the use of the normal curve in practical testing. We did indeed find in the latter curves a less pronounced degree of kurtosis, but the reason of this is a matter of doubt. In any case, even in the F. counts, the skewness is far too distinct to allow the hope of any Gaussian tests being yet valid. Moreover, we have reason to think that Dr Fleming has reached the limit of thickness in emulsion compatible with accurate counting (vid. sup.

* As for example, that of Dr R. W. Allen, *Vaccine Therapy and the Opsonic Method of Treatment*, London, 1908, 2nd Edition, p. 40. Dr Allen's comparison of workers who find the opsonic method unreliable with those surgeons who are unable to perform certain delicate surgical operations seems to us altogether illegitimate. In this connection we must point out that a reference by Dr Allen (*op. cit.* p. 41) to a preliminary communication by one of us is liable to misconstruction. The statement that the "unavoidable error" involved in opsonic determination is not more than 10 per cent. is not a deduction from our preliminary note but rests entirely on the authority of Dr Allen and other pathologists.

† Greenwood, *Practitioner*, Vol. 80, 1908, p. 641.

p. 388 discussion of N.S.A.). Any test therefore must be based on the full acceptance of the skewness of phagocytic distributions.

Of the consequences of this admission we shall not here speak at length: we are at least justified in pointing out the danger of attaching weight to the evidence of small samples.

There is no ground for the expectation that random deviations in excess or defect of a mean value will occur with equal frequency.

Again, distributions with high and low mean and modal values not being always even of the same type, in forming a ratio we may be treating as comparable quantities which are, in some respects, incommensurable. While this latter consideration may be less weighty the former is of great importance.

Having definitely, we think, established our contention as to the skewness of the phagocytic populations, we ask—what will be the distribution of means of samples taken from such a population?

To answer this we should require perhaps 300 samples of 50 or a total count of 15,000 cells; we have not the hardihood to ask Dr Fleming or Dr Strangeways to undertake so heroic a count.

One of Dr Strangeways' counts, however, extended to 2000 cells, and he grouped his results in 80 batches of 25.

Adopting a somewhat coarse unit of grouping—0·12 bacilli—and using Sheppard's corrections, we obtained the following constants:

Mean* 1·691, Mode* 1·540, $\mu_2 = 7{\cdot}46104$, $\beta_1 = {\cdot}475566$, $\beta_2 = 3{\cdot}31849$.

$\kappa_3 = -{\cdot}50733$, Range* 1·0366 to 4·15397.

Equation: $y = 12{\cdot}03429 \left(1 + \frac{x}{4{\cdot}197737}\right)^{1{\cdot}93937} \times \left(1 - \frac{x}{21{\cdot}780512}\right)^{10{\cdot}0627}$.

$P = {\cdot}92$. Skewness = ·4597. See Graph 16.

Now a sample of 80 means is too small to use as a conclusive argument, and besides, few or no pathologists would confine themselves to a phagocytic count of 25. Nevertheless, regarding the curve as an illustration, it suggests some interesting reflections.

The skewness is of course reduced, as we should expect on theoretical grounds, but still quite sensible and of the same order as in the case of the F. distributions. Supposing for a moment that the curve represents truly the distribution of the whole "population" of means, we see clearly how inappropriate would be the ordinary nomenclature for probable errors.

Thus the chance against a positive deviation as great as or greater than ·1691 is 3·6 to 1, while the chance against a negative deviation of ·0691 is 1·88 to 1.

* These values are reduced to unit of observation, the equation is in terms of the statistical unit of grouping.

Translating these results into terms of opsonic indices, an index of ·9 is more likely to occur in random sampling than one of 1·1, or positive and negative deviations from unity do not occur with equal frequency (see Table VIII.).

TABLE VIII.

Some Ordinates and Areas from the Curve of Means.

Ordinate	Fraction of Total Area [Total Area = 1] bounded by this ordinate	Odds against such a deviation or a greater	Opsonic Index in terms of Mean
1·353 −	·14971	5·68 to 1	·8
1·5219 −	·34773	1·88 to 1	·9
1·8601 +	·73464	3·60 to 1	1·1
2·195 +	·92572	12·46 to 1	1·3

Concluding, we have shown: (1) that phagocytic counts have pronouncedly skew distributions; (2) that the means of small samples have likewise a skew distribution; (3) that although there is a sensible reduction in skewness when the modal value is raised by the employment of thick bacillary emulsions, there is no ground for thinking that the skewness can, under possible experimental conditions, be so reduced as to render testing on the basis of the Gaussian curve allowable; (4) the F. counts also differ from those of Dr Strangeways in the following respects: (*a*) they exhibit greater absolute but less relative variation, (*b*) the negative portion of the curve is increased, (*c*) they exhibit less uniformity in the value of P; (5) that the doubts expressed by Pearson as to the validity of employing "normal" tests for samples of skew material are experimentally proved to be well-founded.

A further examination of these phenomena and an attempt to solve approximately some of the problems arising therefrom will form the subject of a second memoir*.

* We desire to express our sense of obligation to Professor Pearson, who has kindly allowed some of the more important calculations to be verified in his laboratory and has constantly helped us with advice and criticism.

A BIOMETRIC STUDY OF THE RED BLOOD CORPUSCLES OF THE COMMON TADPOLE (*RANA TEMPORARIA*), FROM THE MEASUREMENTS OF ERNEST WARREN, D.Sc.

By KARL PEARSON, F.R.S.

(1) On leaving for Natal in 1902 to take up his duties at the Government Museum, Pietermaritzburg, Dr Warren placed in my hands a quantity of material, the reductions of which will be published with many other data in a forthcoming memoir on homotyposis. Among this material were measurements on the red blood corpuscles of 71 tadpoles from a pond at Hendon. These measurements were, for several reasons, of peculiar interest to me. I had been working at the blood corpuscles of frogs, and had met with several difficulties in the investigation. One group of these difficulties turned on the problem of the "small sample," and the second set on the doubt which arose in my own mind as to whether the size of the cell in the individual of any species can be considered as independent of the bulk or age of the individual.

An interdependence of the two appeared to me not improbable on the basis of statistical material, a part only of which has been published. It is clear that any correlation of the kind indicated will influence to a greater or less extent the determination of homotyposis in the case of such cells. From a careful examination of the data themselves I was unable to detect signs of differentiation* in the *sizes* of the red blood corpuscles of any individual; nor were my biological friends able to give me evidence that such *size* differentiation actually existed for the tadpole, or indeed, if it existed at all, that it affected any *large* percentage of the red blood corpuscles of the frog or any other species. Differentiation was based in most cases on other than size characters.

In the absence of Dr Warren from England I do not feel justified, however, in making him responsible for any conclusions I may draw from his measurements.

* A large amount of algebraical work was undertaken in the endeavour to break up the frequency distributions of the blood corpuscles into components, but no definite evidence of size heterogeneity could be obtained. The apparent bimodal nature of the characters in Tables A, D and F (pp. 412, 415, 417) emphasised in the homotyposis tables failed to allow of algebraic resolution, and is, I think, solely a result of the paucity of the sample.

The whole of the labour of measurement is due to him, and this is, perhaps, the most important part of the work. I have to thank my late colleague and assistant, Dr Alice Lee, and my present assistant, Miss Julia Bell, for most of the arithmetical work. My own task has been that of suggesting the nature of the statistical reductions to be made, and drawing from them possibly disputable conclusions. Foremost among these I take to be the point raised by Dr Warren himself in 1903, that in many cases an intimate relation exists between the size of the body and the size of the cell*. In the case of *Daphnia magna* the cell was a constituent part of the body length; in the present case we have to deal with a related but detached cell. I cannot avoid making the suggestion that the field for inquiry here is not only very wide, but exceedingly important.

The second difficulty that arises in the homotyposis of cellular characters is the practical difficulty of obtaining and measuring a sufficiently large sample of a cell population. The whole theory of "small" samples is only at present owing to the labours of von Bortkewitsch†, "Student"‡ and others, in course of development. But it is easy to see that the general effect of "small" sampling is to increase the apparent variability of the means of the sub-populations by terms depending on the error of random sampling and thus to make the variability of an array larger, and consequently the correlation, or in the special case the homotyposis, smaller than it should be as a result of "large" sampling. It is needful accordingly to bear in mind the double possibility (*a*) that cell size is correlated with the growth of the individual, and (*b*) that "small" sampling has considerable influence on these intercellular correlations.

(2) Dr Warren's material was collected at Hendon. The total length from tip of tail to head, and the body length from head to anus were measured. The end of the tail being removed, the maximum length and breadth of 25 corpuscles from a drop of blood from the wound were measured with an ocular micrometer. In the present paper, if the characters of rather more than 25 corpuscles were determined in a few cases by Dr Warren, I have dealt only with the first 25.

In the first place I shall consider the relation of cell length to body length, choosing this instead of total length as the length of the tail is much influenced by the changing state of development. Table A (see p. 412) gives the actual measurement of 25 blood corpuscles of 71 tadpoles, cell length against body length. In Diagram I. I have represented the same result graphically, taking the means of the lengths from the table below.

The correlation coefficient between cell and body length is $r = -\cdot 25$, and the correlation ratio—not very widely removed from it in value, and thus indicating approximately linear regression—is $\eta = \cdot 28$, with a probable error of about $\cdot 02$. Thus there can be no doubt from this result that the size of the blood corpuscle of

* *Biometrika*, Vol. II. p. 255.

† *Das Gesetz der kleinen Zahlen*, Leipzig, 1898.

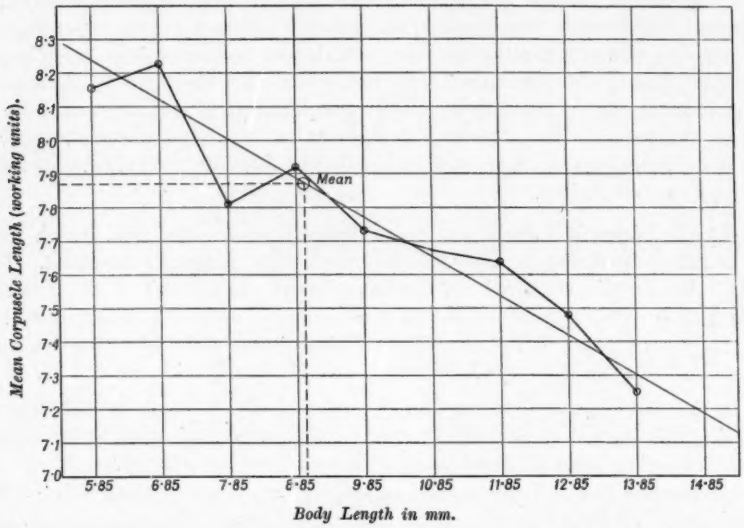
‡ *Biometrika*, Vol. VI. p. 1, and Vol. VI. p. 302.

TABLE I.

Mean Cell Length for each Body Length.

Body Lengths Millimetres	Mean Cell Length Working units	Millimetres
5·35— 6·35	8·15	·0218
6·35— 7·35	8·22	·0220
7·35— 8·35	7·81	·0209
8·35— 9·35	7·91	·0212
9·35—10·35	7·73	·0207
10·35—11·35	7·67	·0206
11·35—12·35	7·64	·0205
12·35—13·35	7·48	·0200
13·35—14·35	7·25	·0194
All body Lengths	7·86	·0211

DIAGRAM I. Regression Line of Length of Blood Corpuscle on Body Length. *R. temporaria.*



the tadpole diminishes as it develops. It appears to me that this point wants testing in other species; it may well be that we are here dealing with a peculiar cellular change consequent on the development of the tadpoles, the larger of which were beginning to develop hind- and in a few cases fore-limbs. At the same time the decrease in size of blood corpuscles appears to have started with tadpoles so small that they showed no sign of limb development. The correlation $-\cdot25$ is in excellent agreement for the result obtained for tadpoles of *B. vulgaris*, namely $-\cdot28$; see Table IV. below. It will be obvious that if absolute lengths of the

corpuscles were taken in either case, we should screen the true homotyposis owing to this change of corpuscle size with growth.

We can still further illustrate this point by finding the correlation between *total* length, that is 'body' + 'tail,' and the length of the corpuscle. We have $r = -\cdot23$, showing a somewhat less, but still quite sensible, negative correlation, or the size of the corpuscle decreases with increasing total body length. I now proceeded to correlate the total length with the body length, and found $r = \cdot93$. Now it is a noteworthy result of these numbers that $\cdot93 \times -\cdot25 = -\cdot23$, or well within the limits of random sampling, we have:

Correlation of body length and cell length × correlation of total length and body length = correlation of total length and cell length.

That is to say, the partial correlation coefficient of total length on cell length for a constant body length is zero. We may therefore infer that the length of the tail has little or no influence on the length of the corpuscles, which are affected only by the growth of the body.

In Dr Warren's measurements, one ocular unit for the length or breadth of the corpuscle = ·00268 mm., and the mean length of 1775 blood corpuscles of tadpoles was 7·8554 working units = ·0211 mm. The late Professor Weldon measured for me, in 1901, 50 red blood corpuscles from each of 20 frogs. The method of procedure was somewhat different to that of Dr Warren, the frog being killed with chloroform and the blood taken from the heart; the frogs were from the neighbourhood of Oxford, whereas the tadpoles came from Hendon. Professor Weldon also drew the corpuscles, using a *camera lucida*. The mean cell length of these 1000 blood corpuscles of the adult frog was ·0256 mm. Comparing this value with that found for the tadpole at various stages as well as the mean value, it would seem highly probable that notwithstanding change of local race, the data point to the increase of size of the blood corpuscle of the frog with or after metamorphosis. Dr Warren also measured the length of the blood corpuscle in 25 corpuscles taken from each of 29 "toadpolls," * or tadpoles of *Bufo vulgaris* taken from Kew lake. The mean value found was ·0212, which is in very close agreement with the mean result for the tadpoles from *R. temporaria*.

The following table sums up our results on corpuscle length.

TABLE II.

Length of Red Blood Corpuscles in mm.

Species	Number	Mean	Standard Deviation	Coefficient of Variation
R. temporaria (adult)	1000	·02560 ± ·00004	·00192 ± ·00003	7·50 ± ·11
R. temporaria (tadpole)	1775	·02105 ± ·00004	·00246 ± ·00003	11·69 ± ·13
B. vulgaris (toadpoll)	725	·02118 ± ·00006	·00251 ± ·00004	11·85 ± ·21

* I should like to reintroduce the original of tadpole, i.e. toad-poll, as a convenient popular term for the tadpole of *B. vulgaris*; tadpole being reserved for *R. temporaria*.

We see that the two sets of tadpoles are again in close agreement as to variability, but whether we judge absolutely or relatively their corpuscles are in length more variable than those of the adult frog. It is possible that some amount of this difference of variability may be due to difference of treatment, Dr Warren taking his corpuscles from the truncated tail and Professor Weldon from the heart, but the bulk of the loss of variability is probably due to the fact that the tadpoles were at a variety of stages of growth, and the corpuscles, as we have seen, are also changing with this growth. Tables A, B and C (pp. 412—414) give respectively the correlation tables of body length and cell length, of total length and cell length, and of body length and total length for tadpoles of *R. temporaria*. The body and total lengths are in *mm.*, but the cell lengths in working units, each of which = ·00268 mm.

Table III. gives the biometric constants of the total and body lengths in mm. We see that notwithstanding the small numbers, the relative variabilities are in strikingly close agreement.

TABLE III.

Body and Total Lengths of R. temporaria and B. vulgaris Tadpoles.

Length		Number	Mean	Standard Deviation	Coefficient of Variation
Frog	Body	71	9·058	1·9443	21·46
	Total	69	26·125	5·5326	21·18
Toad	Body	29	8·966	1·7662	19·70
	Total	29	20·415	4·3103	21·11

The great range of variability here exhibited is due to the fact that we are dealing with different stages of growth, all clubbed together. One point, however, comes out from regarding the relative variabilities in Tables II. and III., i.e. that the influence of growth on variability of the body is nearly twice as great as it is on the variability of the cells.

(3) I now pass to the subject of breadth of the corpuscle. Correlating body length with the breadth of the corpuscle, we find from the data in Table D (p. 415):

$$r = -\cdot016 \pm \cdot016.$$

This, as in the case of length of corpuscle, is negative, but it is insensible, having regard to the probable error. This direct correlation is so small that it does not look as if it were solely due indirectly to the correlation between length and breadth of the corpuscle. The latter correlation, found from Table E (p. 416), is ·306, and if we find the partial correlation of breadth and body length for a constant corpuscle length, we have: $r = +\cdot062$, again very slight, but possibly significant, or for a constant length of body, the breadth of corpuscle would increase with size of body.

Let us next investigate how the volume of the corpuscle changes with increasing body length. A rough measure of this volume may be taken as $\gamma = b^2 l$, where b is the breadth and l the length of the corpuscle. If L equal the body length then very closely:

$$r_{\gamma L} = \frac{2v_b r_{bL} + v_l r_{lL}}{\sqrt{4v_b^2 + v_l^2 + 4v_b v_l r_{bl}}}.$$

Now the constants of the breadth frequency are

Mean = ·01530 mm. Standard Deviation = ·00208 mm.

Coefficient of Variation = $v_b = 13{\cdot}575$.

Hence remembering that $v_l = 11{\cdot}69$, $r_{bL} = -{\cdot}016$, $r_{lL} = -{\cdot}245$ and $r_{bl} = {\cdot}306$, we deduce:

$$r_{\gamma L} = -{\cdot}101.$$

We therefore conclude that the corpuscular volume decreases very slightly with the growth of the tadpole, but the more significant change is the negative correlation of corpuscular length, or the reduction of the corpuscular length with growth.

For comparison we have only the relatively few toadpolls, whose corpuscles were measured by Dr Warren. These give us the results below:

TABLE IV.

Comparison of Breadth in Corpuscles from Tadpoles of Toad and Frog.

	Number	Mean	Standard Deviation	v_b	r_{bl}	r_{bL}	r_{lL}
B. vulgaris ...	725	·01581	·00186	11·74	·520	−·196	−·277
R. temporaria...	1775	·01530	·00208	13·58	·306	−·016	−·245

It will be noted that the breadth is a more variable character than the length of the corpuscle in tadpoles. For toadpolls the variation is almost equal for length and breadth, but all the correlations are higher. In particular $r_{\gamma L} = -{\cdot}252$, being more than double the tadpole value. The smallness of the sample does not allow of our placing much stress on these differences, but in the essential feature that the blood corpuscle becomes smaller as the organism develops the toadpoll confirms the tadpole results completely.

For our present purposes it is desirable to follow out further the effect of increasing length on the breadth of the tadpole corpuscle. The value of the correlation ratio, η, was calculated from the length-breadth table (Table E, p. 416), and we found that while:

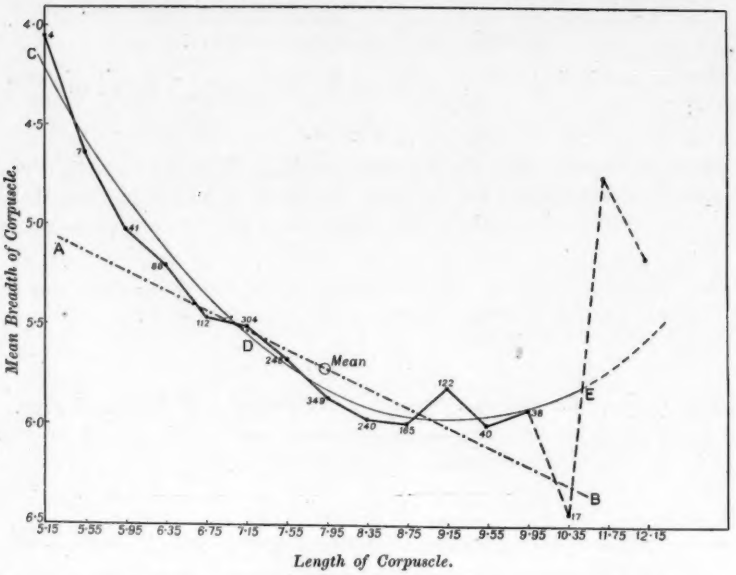
$$r = {\cdot}306 \pm {\cdot}015,$$

$$\eta = {\cdot}350.$$

There appeared thus to be a significant difference and on drawing the regression line, it was at once seen to be curved: see Diagram II.

The facts that the length of the corpuscle decreases with the growth of the tadpole, and further that the correlation between length and breadth is not very marked and is not linear, render it hard to obtain any character of the blood corpuscle free from growth changes.

DIAGRAM II. *R. temporaria* Tadpoles. Regression of Breadth on Length of Corpuscle.



The diagram shows the badness of fit of the regression line AB, and the improvement of fit when we adopt the regression parabola CDE*, or:

$$\frac{y-\bar{y}}{\sigma_y} = r\frac{x-\bar{x}}{\sigma_x} \pm \sqrt{\frac{\eta^2-r^2}{\beta_2-\beta_1-1}}\left\{\left(\frac{x-\bar{x}}{\sigma_x}\right)^2 - \sqrt{\beta_1}\frac{x-\bar{x}}{\sigma_x} - 1\right\},$$

where β_1, β_2 are the usual biometric functions of the moments, σ_x and σ_y the standard deviations, $\bar{x}$, $\bar{y}$ the means of the lengths and breadths of the corpuscles.

In the present case the equation to this parabola referred to the mean as origin is:

$$Y = \cdot 270X - \cdot 109X^2 + \cdot 094.$$

In judging of the fitness of the parabola no weight can be given to the means of the first and last few arrays, which contain very small numbers of corpuscles;

* Pearson: "On the General Theory of Skew Correlation," *Drapers' Research Memoirs* (Dulau & Co.), p. 29.

the observed frequency is placed alongside each point. It may be doubted whether the ultimate decrease of breadth with increasing length is real and not solely due to the two abnormally narrow corpuscles of maximum length. Still there is some sign of a tendency to reduced breadth before these are reached.

(4) I had much hoped that the index of the blood corpuscle would be a character free from growth changes, but the previous section shows that in this respect it is not available. A direct investigation of the correlation of the body length of the tadpole and the index of its blood corpuscles (Table F) gives for the coefficient of correlation,

$$r = +\cdot179 \pm \cdot016.$$

Thus the index alters with the growth of the tadpole quite significantly, but not so intimately as in the case of the length of the corpuscle. The change is of course in the opposite direction since the index = breadth/length, and the small decrease in breadth is more than compensated by the greater decrease in length. The corpuscle tends to become rounder with the growth of the tadpole.

For comparative purposes, we find:

TABLE V.

Comparison of Corpuscle Indices for Tadpoles of Toad and Frog.

	Number	Mean	Standard Deviation	v_i	r_{iL}
B. vulgaris ...	725	·751	·0810	10·77	+·081
R. temporaria ...	1775	·732	·1047	14·31	+·179

It would thus appear that the corpuscle in the toadpoll is somewhat more orachycalic than in the tadpole, sensibly less variable and less modified by growth.

On plotting the means of the index arrays to the successive body lengths for tadpoles, the resultant regression line was a very irregular polygon, but showed distinct signs of a non-linear regression. Accordingly the correlation ratio η was found for the indices and body length, and gave the value $\eta = \cdot348$, thus demonstrating that the index does not increase uniformly with the body length. It rises in fact quickly with body lengths from 5·6 to 7·8, and then remains nearly constant. I may remark that for a somewhat different series of tadpoles, the correlation ratio between index and *total* length, *not* body length, was found to be somewhat higher, i.e. $\eta = \cdot405$. There is thus more relation between index of corpuscle and growth of the tadpole than is indicated by the correlation coefficient ·179. In the case of toadpoll's corpuscles, the regression is again not linear and the correlation ratio, η, is equal to ·273. To get rid of the lumpiness due to taking only 25 corpuscles from 71 tadpoles and 29 toadpolls, we need probably 50 to 100 corpuscles from four or five hundred individuals.

(5) Lastly an attempt was made to ascertain to what extent the blood corpuscles of an individual are characteristic of that individual. The difficulties here are undoubtedly considerable. At the outset of the investigation it was not anticipated that the red blood corpuscles would change in size with the growth of the individual, and it might well have been expected that if this should prove to be the case, the index would still be practically free from the growth factor. In the next place a good deal more inquiry is needed as to the influence of the locus of withdrawal and the treatment of the blood corpuscles, before very definite conclusions are drawn. 50 blood corpuscles drawn from the heart after obliterating the central nervous system in the case of Frog No. 3, when examined without any reagents, gave a value of the mean length = ·0262 mm. A second series of 50 blood corpuscles from the heart mixed with normal salt solution and exposed to vapour of chloroform for 20 to 30 seconds before measurement, gave mean length ·0260 mm. The mean length of 1000 corpuscles of adult frogs

$$= \cdot 0256 \pm \cdot 00004.$$

The error of a random sample of 50 would be about ·0002. It cannot therefore be asserted that the difference of the two samples of the same blood is due to treatment; it is just what might be expected in two random samples. Further the two sample means appear to be significantly different from the mean of the general population of corpuscles. Samples of at least 50 to 100 (and better the latter) ought to be taken, and uniformity observed in time of measurement after extraction and in actual treatment. The immense amount of labour involved is, however, a very serious consideration in such large sampling.

The problem of possible heterogeneity must also be borne in mind, but I think we may definitely assert that the blood corpuscles here dealt with certainly did not belong to any *two* well-marked classes, they failed to give real solutions in all attempts at analysis. It is of course conceivable, in fact not improbable, that the red corpuscles as a population are in various stages of growth, and till more is known as to the place and manner of production of these corpuscles it would be profitless to hazard any guess as to how this may affect the variability and individuality of the population. This may account in part for the relatively low values found for homotyposis in these free cells as compared with my unpublished data for homotyposis in fixed cells.

Emphasising these preliminary points, I will put together the results so far reached for the homotyposis or degree of resemblance of blood corpuscles in the same individual.

The probable errors are based on the number of corpuscles, not on the number of individuals or of pairs dealt with.

It will be obvious from this table that there is a sensible degree of individuality in the corpuscles of the same individual, the raw values of the coefficients are sufficient to demonstrate this. Further, by correcting for change in the blood

TABLE VI.

Homotyposis in the Red Blood Corpuscles of Frog and Toad.

	Character	Number of Individuals	Number of Pairs	Raw Value	Corrected Value	Table
R. temporaria, Adult...	Length	20	49,000	·153 ± ·021	?*	G, p. 417
R. temporaria, Tadpoles	Index	71	42,600	·333 ± ·014	·405	H, p. 418
" "	Length	61	36,600	·186 ± ·017	·206	I, p. 418
B. vulgaris, Toadpolls...	Index	29	17,400	·121 ± ·025	·134	J, p. 419

corpuscle with growth, we get somewhat higher values. If r be the raw correlation coefficient, η the correlation ratio between the character and stage of growth, R the corrected correlation and m the number of homotypes used, then I have shown that†:

$$R = \frac{r}{1-\eta^2} + \frac{\eta^2}{(m-1)(1-\eta^2)}.$$

From this formula are found the "corrected" values given in the last column of the table. It will be seen that while the changes are in the right direction, they do not raise the homotyposis to the value we might have anticipated from other published and unpublished homotypic results. We therefore conclude that while there is undoubtedly individuality of a homotypic character in the blood corpuscles of the species dealt with, there are very probably differentiating factors, not yet studied, which have not been allowed for when we merely correct the correlations on the basis of body growth. The suggestion that naturally arises is that the cell undergoes changes not only in relation to bodily growth, but probably in relation to its own life.

(6) *Conclusions.*

The object of the present paper will be fulfilled if it shows that:

(i) the size and form of the blood corpuscle is related to the life history of the organism to which it belongs;

(ii) there is a quite sensible individuality in the blood corpuscles of the same individual, if it be not so intense as the mean value which has been found for the homotyposis of purely homologous organs;

(iii) there is a wide field here for biometric inquiry, but it needs much labour and persistence, if the sample is to be 50—100 corpuscles in each of 400 to 500 individuals.

* No body measurement was taken on these frogs, which were described merely as adult; thus no correction for size can be made.

† "On Homotyposis in Homologous, but differentiated Organs." *Proc. R. S.* Vol. 71, pp. 303—4 and footnote.

APPENDIX.

TABLE A.

R. temporaria, Tadpoles. Body Length and Length of Blood Corpuscles.

Body Length.

Length of Blood Corpuscles.	5·35— 5·85	5·85— 6·35	6·35— 6·85	6·85— 7·35	7·35— 7·85	7·85— 8·35	8·35— 8·85	8·85— 9·35	9·35— 9·85	9·85—10·35	10·35—10·85	10·85—11·35	11·35—11·85	11·85—12·35	12·35—12·85	12·85—13·35	13·35—13·85	13·85—14·35	Totals
4·95— 5·15	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
5·15— 5·35	—	—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	3
5·35— 5·55	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	2
5·55— 5·75	—	—	—	—	1	—	—	—	—	—	2	—	—	—	1	—	1	—	5
5·75— 5·95	—	—	—	—	3	—	1	1	2	—	4	—	—	—	—	—	—	—	11
5·95— 6·15	—	—	2	—	1	1	1	1	2	5	10	2	2	—	1	—	2	—	30
6·15— 6·35	—	1	1	1	2	1	2	7	2	4	4	2	2	1	3	—	1	2	36
6·35— 6·55	—	—	1	2	3	4	4	5	2	4	16	3	1	1	4	—	2	—	52
6·55— 6·75	2	—	3	1	2	1	4	9	3	3	—	1	2	1	3	—	—	1	36
6·75— 6·95	—	1	2	2	3	7	9	2	7	10	12	3	4	2	4	—	4	4	76
6·95— 7·15	1	4	7	8	8	9	14	9	11	9	17	13	2	1	3	—	3	3	122
7·15— 7·35	6	3	9	11	7	18	20	15	16	12	19	11	4	3	16	—	7	5	182
7·35— 7·55	4	3	7	17	10	11	15	10	8	9	15	9	8	1	5	—	1	1	134
7·55— 7·75	—	9	5	6	6	5	27	15	11	3	9	5	3	4	3	—	1	2	114
7·75— 7·95	5	10	13	20	10	18	22	12	21	10	11	11	3	3	10	—	1	2	182
7·95— 8·15	13	10	8	17	5	12	24	15	8	9	18	11	5	5	5	—	1	1	167
8·15— 8·35	5	5	10	21	10	11	17	18	12	10	16	10	1	2	13	—	—	1	162
8·35— 8·55	3	6	6	10	2	6	12	7	14	1	4	5	1	—	1	—	—	—	78
8·55— 8·75	3	5	6	6	5	4	5	3	6	4	12	5	2	—	—	—	—	—	66
8·75— 8·95	4	7	9	20	4	5	12	8	11	3	8	2	3	—	1	—	1	1	99
8·95— 9·15	—	3	11	12	10	3	9	2	4	3	5	2	2	1	1	—	—	1	69
9·15— 9·35	2	4	7	9	1	2	7	6	4	—	5	2	4	—	—	—	—	—	53
9·35— 9·55	1	1	6	1	2	2	5	—	1	1	3	—	—	—	—	—	—	—	23
9·55— 9·75	—	1	3	3	—	2	2	1	1	—	2	2	—	—	—	—	—	—	17
9·75— 9·95	—	2	3	7	—	1	3	2	1	—	3	—	—	—	—	—	—	—	22
9·95—10·15	1	—	2	1	2	2	2	1	—	—	2	—	—	—	—	—	—	1	14
10·15—10·35	—	—	1	—	1	—	5	—	3	—	1	—	—	—	1	—	—	—	12
10·35—10·55	—	—	1	—	—	—	3	1	—	—	—	—	—	—	—	—	—	—	5
10·55—10·75	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
10·75—10·95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
10·95—11·15	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Totals	50	75	125	175	100	125	225	150	150	100	200	100	50	25	75	0	25	25	1775

TABLE B.

R. temporaria, Tadpoles. Total Length (with tail) and Length of Corpuscles.

Body Length (with tail).

Length of Corpuscles.	16·35—17·35	17·35—18·35	18·35—19·35	19·35—20·35	20·35—21·35	21·35—22·35	22·35—23·35	23·35—24·35	24·35—25·35	25·35—26·35	26·35—27·35	27·35—28·35	28·35—29·35	29·35—30·35	30·35—31·35	31·35—32·35	32·35—33·35	33·35—34·35	34·35—35·35	35·35—36·35	36·35—37·35	37·35—38·35	38·35—39·35	39·35—40·35	40·35—41·35	41·35—42·35	42·35—43·35	Totals
4·95— 5·15	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
5·15— 5·35	—	—	—	—	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
5·35— 5·55	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
5·55— 5·75	—	—	—	—	—	1	—	—	—	—	1	—	1	—	—	—	—	—	—	2	—	—	—	—	—	—	—	5
5·75— 5·95	—	—	—	2	—	1	—	1	—	—	2	—	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	10
5·95— 6·15	—	1	—	2	—	1	—	1	1	—	5	3	1	3	6	1	1	—	—	3	—	—	—	—	—	—	—	29
6·15— 6·35	—	—	1	—	2	1	—	2	2	2	2	6	4	2	2	3	—	—	—	4	—	1	—	—	—	—	2	36
6·35— 6·55	—	—	1	3	—	1	1	6	2	2	1	5	9	5	3	2	2	1	—	5	—	1	1	—	—	—	—	51
6·55— 6·75	2	2	—	2	2	1	1	1	2	6	—	8	—	—	3	1	—	—	—	2	—	1	1	—	—	—	1	36
6·75— 6·95	—	1	1	4	1	1	2	7	3	5	1	6	6	1	11	2	2	3	—	7	—	2	1	—	—	—	4	71
6·95— 7·15	—	2	4	8	7	5	3	11	6	10	4	15	9	4	8	6	4	3	—	5	—	1	1	—	—	—	3	119
7·15— 7·35	4	4	3	10	9	5	2	17	8	19	4	20	9	4	12	7	3	2	—	16	—	3	7	—	—	—	5	173
7·35— 7·55	2	5	3	13	7	9	4	17	7	7	1	17	6	10	9	2	—	6	—	4	—	1	2	—	—	—	1	133
7·55— 7·75	2	1	6	8	5	3	—	12	14	13	4	18	3	6	2	3	1	1	—	2	—	4	2	—	—	—	2	112
7·75— 7·95	5	8	6	6	19	11	4	20	6	12	4	24	17	3	4	8	2	1	—	10	—	3	1	—	—	—	2	176
7·95— 8·15	11	8	5	13	12	5	2	16	5	15	7	16	9	8	6	7	2	4	—	6	—	5	—	—	—	—	1	163
8·15— 8·35	3	6	5	10	15	4	1	21	4	9	8	24	12	7	4	5	2	1	—	6	—	2	7	—	—	—	1	157
8·35— 8·55	6	2	4	2	6	5	1	7	3	8	2	17	5	2	2	1	2	—	—	1	—	—	—	—	—	—	—	76
8·55— 8·75	3	4	2	9	2	4	—	7	3	3	2	6	12	4	1	—	2	1	—	—	—	—	—	—	—	—	—	65
8·75— 8·95	7	4	4	12	12	5	1	7	5	9	—	16	5	2	1	—	1	2	—	1	—	—	1	—	—	—	1	96
8·95— 9·15	1	—	7	8	12	2	1	10	3	5	—	6	2	4	1	1	1	—	—	1	—	1	—	—	—	—	1	67
9·15— 9·35	2	—	8	7	6	3	—	6	—	5	—	8	3	3	—	1	—	—	—	—	—	—	—	—	—	—	—	52
9·35— 9·55	—	2	4	2	1	1	—	3	—	5	—	1	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	23
9·55— 9·75	—	—	2	2	2	1	1	—	—	2	—	2	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	16
9·75— 9·95	1	—	4	—	3	4	—	—	—	3	—	3	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	21
9·95—10·15	1	—	2	—	1	—	1	2	—	3	—	—	1	1	—	—	—	—	—	—	—	—	1	—	—	—	1	13
10·15—10·35	—	—	1	—	—	—	—	1	—	5	—	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
10·35—10·55	—	—	1	—	—	—	—	—	1	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5
10·55—10·75	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
10·75—10·95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
10·95—11·15	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Totals	50	50	75	125	125	75	25	175	75	150	50	225	125	75	75	50	25	25	0	75	0	25	25	0	0	0	25	1725

TABLE C.

R. temporaria, Tadpoles. Body Length with and without tail.

Body Length without tail.

Body Length with tail.	5·35— 6·85	6·85— 6·35	6·35— 6·85	6·85— 7·35	7·35— 7·85	7·85— 8·35	8·35— 8·85	8·85— 9·35	9·35— 9·85	9·85—10·35	10·35—10·85	10·85—11·35	11·35—11·85	11·85—12·35	12·35—12·85	12·85—13·35	13·35—13·85	13·85—14·35	Totals
16·35—17·35	1	1																	2
17·35—18·35	1		1																2
18·35—19·35		1		1															3
19·35—20·35			1	2	1														5
20·35—21·35			1	1	1														5
21·35—22·35				1	4	1													3
22·35—23·35					2	1													7
23·35—24·35						1	2												3
24·35—25·35						2	3	3											8
25·35—26·35							2	4											6
26·35—27·35							1												1
27·35—28·35							3												3
28·35—29·35								4											4
29·35—30·35								1											1
30·35—31·35								2	1										3
31·35—32·35								1											1
32·35—33·35																			0
33·35—34·35																			0
34·35—35·35																			0
35·35—36·35																			0
36·35—37·35																			0
37·35—38·35																			0
38·35—39·35																			0
39·35—40·35																			0
40·35—41·35																			0
41·35—42·35																			0
42·35—43·35																			0
Totals	2	3	5	7	4	4	9	6	5	8	4	2	1	3	0	1	1	1	69

TABLE D.

R. temporaria, Tadpoles. Body Length and Breadth of Corpuscles.

Body Length.

Breadth of Blood Corpuscles.	5·35— 5·85	5·85— 6·35	6·35— 6·85	6·85— 7·35	7·35— 7·85	7·85— 8·35	8·35— 8·85	8·85— 9·35	9·35— 9·85	9·85—10·35	10·35—10·85	10·85—11·35	11·35—11·85	11·85—12·35	12·35—12·85	12·85—13·35	13·35—13·85	13·85—14·35	Totals
2·95—3·15	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
3·15—3·35	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
3·35—3·55	—	—	2	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	4
3·55—3·75	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3·75—3·95	—	—	2	1	—	—	—	—	—	—	1	—	1	—	—	—	—	—	5
3·95—4·15	—	—	3	1	—	1	2	1	1	—	4	—	2	—	—	—	—	—	15
4·15—4·35	—	—	8	5	3	4	4	1	4	3	8	—	7	—	2	—	4	—	53
4·35—4·55	1	2	4	1	2	—	—	1	3	—	5	—	5	—	—	—	1	—	25
4·55—4·75	1	3	8	7	1	5	4	3	6	2	5	3	3	—	4	—	—	3	58
4·75—4·95	5	—	9	8	3	13	14	7	15	9	12	7	5	—	4	—	1	1	113
4·95—5·15	6	5	15	16	5	9	7	5	8	5	10	6	2	2	4	—	5	2	112
5·15—5·35	9	7	16	36	14	19	13	15	27	13	14	7	5	6	11	—	2	4	218
5·35—5·55	7	7	8	24	11	11	19	18	9	12	19	12	7	3	8	—	3	7	185
5·55—5·75	8	7	7	13	5	9	22	10	10	12	13	14	2	2	8	—	4	2	148
5·75—5·95	1	8	8	15	8	8	27	15	23	7	18	6	2	4	4	—	3	3	160
5·95—6·15	1	7	9	16	11	9	17	14	10	5	25	11	4	2	7	—	1	2	151
6·15—6·35	7	7	9	14	9	12	30	25	16	11	29	9	4	2	9	—	1	—	194
6·35—6·55	3	4	6	3	4	8	12	10	7	3	14	7	—	3	6	—	—	1	91
6·55—6·75	1	1	1	3	7	6	12	7	3	5	11	4	—	—	3	—	—	—	64
6·75—6·95	—	7	4	5	6	3	15	10	6	6	4	4	1	—	4	—	—	—	75
6·95—7·15	—	3	—	5	4	1	10	3	2	2	3	6	—	1	1	—	—	—	41
7·15—7·35	—	5	1	2	4	5	7	1	—	1	3	4	—	—	—	—	—	—	33
7·35—7·55	—	1	1	—	—	—	3	1	—	1	1	—	—	—	—	—	—	—	8
7·55—7·75	—	—	—	—	—	1	3	1	—	1	—	—	—	—	—	—	—	—	6
7·75—7·95	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	3
7·95—8·15	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	2
8·15—8·35	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	2
8·35—8·55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
8·55—8·75	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	2
8·75—8·95	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
8·95—9·15	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Totals	50	75	125	175	100	125	225	150	150	100	200	100	50	25	75	0	25	25	1775

TABLE E.

R. temporaria, Tadpoles. Length and Breadth of Corpuscles.

Length of Corpuscle.

Breadth of Corpuscle.	4·95— 5·15	5·15— 5·35	5·35— 5·55	5·55— 5·75	5·75— 5·95	5·95— 6·15	6·15— 6·35	6·35— 6·55	6·55— 6·75	6·75— 6·95	6·95— 7·15	7·15— 7·35	7·35— 7·55	7·55— 7·75	7·75— 7·95	7·95— 8·15	8·15— 8·35	8·35— 8·55	8·55— 8·75	8·75— 8·95	8·95— 9·15	9·15— 9·35	9·35— 9·55	9·55— 9·75	9·75— 9·95	9·95—10·15	10·15—10·35	10·35—10·55	10·55—10·75	10·75—10·95	10·95—11·15	Totals
2·95—3·15	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
3·15—3·35	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
3·35—3·55	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	4
3·55—3·75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
3·75—3·95	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	5
3·95—4·15	1	—	—	—	—	—	1	—	—	—	1	2	—	2	1	1	—	—	1	1	1	—	—	1	2	—	—	—	—	—	—	15
4·15—4·35	—	2	—	2	1	2	1	7	—	1	5	4	6	2	—	2	3	—	2	4	5	2	—	—	1	1	—	—	—	—	—	53
4·35—4·55	—	—	—	2	—	1	1	1	—	1	2	—	5	3	1	2	2	1	—	—	1	—	1	1	—	—	—	—	—	—	—	25
4·55—4·75	—	—	1	—	1	4	6	1	2	4	7	5	4	1	7	2	1	1	1	5	2	1	—	—	1	—	1	—	—	—	—	58
4·75—4·95	—	—	—	—	2	6	5	6	7	5	17	14	6	6	5	9	6	4	3	1	5	2	—	2	—	—	—	1	1	—	—	113
4·95—5·15	—	—	1	1	1	3	10	2	3	10	7	13	10	5	10	6	9	3	3	4	3	4	—	2	—	1	—	—	—	—	1	112
5·15—5·35	—	—	—	—	3	6	5	10	7	8	25	27	19	15	26	19	10	10	1	10	6	6	2	—	3	—	—	—	—	—	—	218
5·35—5·55	—	—	—	—	1	4	4	5	6	15	14	21	10	15	22	10	21	3	6	12	4	7	—	1	1	1	1	1	—	—	—	185
5·55—5·75	—	—	—	—	1	1	1	4	5	9	10	14	17	5	17	15	15	8	5	7	4	4	2	1	1	1	1	—	—	—	—	148
5·75—5·95	—	—	—	—	1	1	1	9	4	8	12	24	15	16	16	11	8	6	11	5	7	2	1	2	—	—	—	—	—	—	—	160
5·95—6·15	—	—	—	—	—	1	—	2	1	6	12	28	12	8	20	15	14	7	2	3	6	4	3	1	2	2	2	—	—	—	—	151
6·15—6·35	—	—	—	—	—	—	—	3	—	4	3	20	15	19	28	25	21	12	6	13	6	3	3	3	2	5	2	1	—	—	—	194
6·35—6·55	—	—	—	—	—	—	1	1	1	3	1	3	1	6	12	14	15	4	4	13	2	3	3	—	3	—	1	—	—	—	—	91
6·55—6·75	—	—	—	—	—	—	—	—	—	2	4	3	4	—	8	16	9	4	5	2	2	1	1	—	2	1	—	—	—	—	—	64
6·75—6·95	—	—	—	—	—	—	—	—	—	—	1	3	7	4	5	8	9	5	8	9	6	5	1	2	1	—	1	—	—	—	—	75
6·95—7·15	—	—	—	—	—	—	—	—	—	—	—	—	2	3	1	2	11	3	5	4	4	3	2	—	—	—	1	—	—	—	—	41
7·15—7·35	—	—	—	—	—	—	—	—	—	—	—	—	1	3	2	6	5	3	2	3	2	2	1	—	2	—	—	1	—	—	—	33
7·35—7·55	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	3	—	2	—	1	—	—	—	—	—	—	—	8
7·55—7·75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	1	—	—	1	—	1	—	—	—	—	6
7·75—7·95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	3
7·95—8·15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
8·15—8·35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
8·35—8·55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
8·55—8·75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	2
8·75—8·95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
8·95—9·15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
Totals	1	3	2	5	11	30	36	52	36	76	122	182	134	114	182	167	162	78	66	99	69	53	23	17	22	14	12	5	1	0	1	1775

Length of Second Corpuscle.

Indices. (Breadth/Length.)

TABLE F.

R. temporaria, Tadpoles. Body Length and Indices.

Body Length.

Indices. (Breadth/Length.)	5·35— 5·85	5·85— 6·35	6·35— 6·85	6·85— 7·35	7·35— 7·85	7·85— 8·35	8·35— 8·85	8·85— 9·35	9·35— 9·85	9·85—10·35	10·35—10·85	10·85—11·35	11·35—11·85	11·85—12·35	12·35—12·85	12·85—13·35	13·35—13·85	13·85—14·35	Totals
·3355— ·3755	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
·3755— ·4155	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
·4155— ·4555	—	—	5	—	—	1	—	—	—	1	1	—	1	—	—	—	—	—	9
·4555— ·4955	—	—	8	5	1	2	—	—	3	1	3	1	5	—	—	—	—	—	29
·4955— ·5355	—	—	10	3	—	—	4	—	2	1	2	1	3	—	1	—	—	2	29
·5355— ·5755	1	2	11	8	2	3	4	2	6	—	5	1	5	—	—	—	—	—	50
·5755— ·6155	5	8	10	22	4	13	13	9	7	4	12	10	5	1	2	—	2	—	127
·6155— ·6555	13	4	13	21	6	10	18	5	13	2	15	9	3	—	4	—	—	1	137
·6555— ·6955	10	12	15	42	11	14	28	20	27	11	20	7	5	4	9	—	2	4	241
·6955— ·7355	10	9	11	27	16	18	31	12	29	12	18	9	2	3	8	—	6	3	224
·7355— ·7755	6	19	13	25	14	20	31	30	34	25	23	7	4	5	19	—	7	9	291
·7755— ·8155	3	12	10	12	15	19	31	24	16	17	34	18	7	7	17	—	5	4	251
·8155— ·8555	2	5	11	5	15	17	33	30	9	16	31	16	3	4	7	—	3	—	207
·8555— ·8955	—	2	2	2	3	5	12	10	3	4	22	9	6	—	4	—	—	2	86
·8955— ·9355	—	2	2	—	8	1	11	4	—	3	11	8	1	1	2	—	—	—	54
·9355— ·9755	—	—	—	2	3	2	8	3	—	2	3	2	—	—	2	—	—	—	27
·9755—1·0155	—	—	—	—	1	—	1	1	1	—	—	1	—	—	—	—	—	—	5
1·0155—1·0555	—	—	—	—	1	—	—	—	—	1	—	1	—	—	—	—	—	—	3
Totals	50	75	125	175	100	125	225	150	150	100	200	100	50	25	75	0	25	25	1775

TABLE G.

Homotyposis in Length of Red Blood Corpuscles in R. temporaria (Adult Frogs).

Length of First Corpuscle.

Length of Second Corpuscle.	39·4—38·5	38·4—37·5	37·4—36·5	36·4—35·5	35·4—34·5	34·4—33·5	33·4—32·5	32·4—31·5	31·4—30·5	30·4—29·5	29·4—28·5	28·4—27·5	27·4—26·5	26·4—25·5	25·4—24·5	24·4—23·5	Totals
39·4—38·5	—	1	7	—	2	19	17	18	16	13	3	2	—	—	—	—	98
38·4—37·5	1	4	11	14	51	73	52	67	44	27	34	11	—	2	1	—	392
37·4—36·5	7	11	36	36	108	201	153	222	157	127	66	28	12	3	9	—	1176
36·4—35·5	—	14	36	122	136	289	260	358	219	145	144	41	22	6	15	6	1813
35·4—34·5	2	51	108	136	606	737	641	795	425	341	268	99	20	14	16	4	4263
34·4—33·5	19	73	201	289	737	1142	1035	1292	853	586	450	142	43	22	18	7	6909
33·4—32·5	17	52	153	260	641	1035	990	1245	839	618	531	208	84	39	39	11	6762
32·4—31·5	18	67	222	358	795	1292	1245	1568	1254	837	677	300	95	38	46	8	8820
31·4—30·5	16	44	157	219	425	853	839	1254	1098	706	595	298	92	36	30	2	6664
30·4—29·5	13	27	127	145	341	586	618	837	706	546	452	221	91	48	43	1	4802
29·4—28·5	3	34	66	144	268	450	531	677	595	452	470	222	98	47	51	8	4116
28·4—27·5	2	11	28	41	99	142	208	300	298	221	222	124	64	20	33	—	1813
27·4—26·5	—	—	12	22	20	43	84	95	92	91	98	64	28	12	24	1	686
26·4—25·5	—	2	3	6	14	22	39	38	36	48	47	20	12	2	5	—	294
25·4—24·5	—	1	9	15	16	18	39	46	30	43	51	33	24	5	12	1	343
24·4—23·5	—	—	—	6	4	7	11	8	2	1	8	—	1	—	1	—	49
Totals	98	392	1176	1813	4263	6909	6762	8820	6664	4802	4116	1813	686	294	343	49	49000

TABLE H.

Homotyposis in Index of Red Blood Corpuscles of Tadpoles, R. temporaria.

Index of First Corpuscle.

Index of Second Corpuscle.	*34—*	*38—*	*42—*	*46—*	*50—*	*54—*	*58—*	*62—*	*66—*	*70—*	*74—*	*78—*	*82—*	*86—*	*90—*	*94—*	*98—*	*102—*	Totals
34—	2	2	8	6	15	9	8	14	4	2	2	—	—	—	—	—	—	—	72
38—	2	—	3	5	7	3	6	9	5	4	2	2	—	—	—	—	—	—	48
42—	8	3	8	18	29	25	30	34	21	11	15	9	4	1	—	—	—	—	216
46—	6	5	18	42	47	68	92	74	86	55	50	55	23	20	6	—	1	—	648
50—	15	7	29	47	46	61	83	88	93	49	68	42	20	11	9	4	—	—	672
54—	9	3	25	68	61	82	151	148	195	130	144	113	59	19	10	3	4	—	1224
58—	8	6	30	92	83	151	308	346	510	401	413	314	185	67	36	20	3	3	2976
62—	14	9	34	74	88	148	346	366	520	467	439	366	255	102	67	29	8	2	3384
66—	4	5	21	86	93	195	510	520	940	804	1015	718	486	189	121	59	14	4	5784
70—	2	4	11	55	49	130	401	467	804	688	895	730	548	198	143	78	18	11	5232
74—	2	2	15	50	68	144	413	489	1015	895	1266	1082	788	339	180	103	24	13	6888
78—	—	2	9	55	42	113	314	366	718	730	1082	972	906	400	226	110	34	17	6096
82—	—	—	4	23	20	59	185	255	486	548	788	906	890	403	286	128	25	10	5016
86—	—	—	1	20	11	19	67	102	189	198	339	400	403	204	125	47	7	4	2136
90—	—	—	—	6	9	10	36	67	121	143	180	226	286	125	82	46	3	4	1344
94—	—	—	—	—	4	3	20	29	59	78	103	110	128	47	46	14	3	4	648
98—	—	—	—	1	—	4	3	8	14	18	24	34	25	7	3	3	—	—	144
102—	—	—	—	—	—	—	3	2	4	11	13	17	10	4	4	4	—	—	72
Totals	72	48	216	648	672	1224	2976	3384	5784	5232	6888	6096	5016	2136	1344	648	144	72	42600

In this table "34—" signifies all corpuscles, the index of which falls into the range 34 up to, but not including, 38 and so on.

TABLE I.

Homotyposis in Length of Red Blood Corpuscles of Tadpoles, R. temporaria.

Length of First Corpuscle.

Length of Second Corpuscle.	*50—*	*55—*	*60—*	*65—*	*70—*	*75—*	*80—*	*85—*	*90—*	*95—*	*100—*	*105—*	Totals
50—	—	4	3	7	21	20	10	3	4	—	—	—	72
55—	4	6	26	33	61	56	50	29	18	2	3	—	288
60—	3	26	150	195	418	295	344	178	99	25	19	—	1752
65—	7	33	195	286	699	430	494	245	122	41	35	5	2592
70—	21	61	418	699	1986	1629	1700	837	502	124	100	11	8088
75—	20	56	295	430	1629	1500	1596	742	495	129	62	6	6960
80—	10	50	344	494	1700	1596	1836	964	674	212	143	17	8040
85—	3	29	178	245	837	742	964	558	411	128	75	6	4176
90—	4	18	99	122	502	495	674	411	384	152	104	11	2976
95—	—	2	25	41	124	129	212	128	152	56	59	8	936
100—	—	3	19	35	100	62	143	75	104	59	40	8	648
105—	—	—	—	5	11	6	17	6	11	8	8	—	72
Totals	72	288	1752	2592	8088	6960	8040	4176	2976	936	648	72	36600

In this table "50—" signifies all corpuscles the lengths of which were 50 or any value up to, but not including, 55 working units. It differs from Table H in that only 61 individuals were included, 10 showing more or less signs of leg development were excluded by the tabulator, but the corpuscles of these 10 do not seem on examination to be markedly different from those of the remainder.

TABLE J.

Homotyposis in Index of the Red Blood Corpuscles of Toadpolls (B. vulgaris).

Index of First Corpuscle.

Index of Second Corpuscle.	*46—*	*50—*	*54—*	*58—*	*62—*	*66—*	*70—*	*74—*	*78—*	*82—*	*86—*	*90—*	*94—*	*98—*	*102—*	*106—*	Totals
46—	–	4	5	5	6	5	8	5	5	1	2	1	1	—	—	—	48
50—	4	4	10	11	14	17	25	25	20	3	6	3	2	—	—	—	144
54—	5	10	10	15	27	32	42	37	35	22	20	3	4	1	1	—	264
58—	5	11	15	10	22	42	69	67	49	18	16	6	3	2	1	—	336
62—	6	14	27	22	72	135	164	206	133	64	50	8	8	2	1	—	912
66—	5	17	32	42	135	260	364	462	307	185	107	28	12	6	5	1	1968
70—	8	25	42	69	164	364	554	794	558	252	166	55	21	11	8	5	3096
74—	5	25	37	67	206	462	794	968	798	386	212	74	19	14	9	4	4080
78—	5	20	35	49	133	307	558	798	678	379	220	63	25	5	9	4	3288
82—	1	3	22	18	64	185	252	386	379	222	111	42	9	3	4	3	1704
86—	2	6	20	16	50	107	166	212	220	111	62	19	9	1	4	3	1008
90—	1	3	3	6	8	28	55	74	63	42	19	2	3	1	2	2	312
94—	1	2	4	3	8	12	21	19	25	9	9	3	—	1	2	1	120
98—	—	—	1	2	2	6	11	14	5	3	1	1	1	—	1	—	48
102—	—	—	1	1	1	5	8	9	9	4	4	2	2	1	—	1	48
106—	—	—	—	—	—	1	5	4	4	3	3	2	1	—	1	—	24
Totals	48	144	264	336	912	1968	3096	4080	3288	1704	1008	312	120	48	48	24	17400

In this table "46—" signifies the group of corpuscles with 46 for index, and any value up to but not including 50, and so on.

DATA ON VARIATION IN THE COMB OF THE DOMESTIC FOWL*.

By RAYMOND PEARL and MAUD DEWITT PEARL.

1. Much of the evidence adduced in support of Mendel's law as a general method of inheritance has been derived from breeding experiments with the domestic fowl. The work of Bateson, Hurst, and Davenport has served to make it a classical object of research in this field. One of the most obvious of the "unit characters" of poultry is the form of the comb. All students of inheritance in this group have included the study of the comb in their work. The behaviour of the various comb types in inheritance is frequently cited as a well-nigh perfect example of typical allelomorphism. The different comb types—single, pea, rose, etc.—are commonly said not to blend in cross-breeding, but instead to be inherited in a strictly alternative manner and in accordance with Mendel's law.

In spite of the extensive use of comb form in poultry as a character in the study of inheritance there has been, so far as we are aware, no particular study ever made of the degree and character of variation within each of the several known types of comb. About a year ago an opportunity was afforded one of us to carry on extensive breeding experiments with poultry. The plans made for the prosecution of such experiments included the investigation of the inheritance of comb characteristics. It was felt to be highly desirable in connection with this work to gain some sort of idea of the degree and manner in which there was variation *within* each of the several comb types. Such questions as the following suggest themselves: How far from the normal in any direction may the single comb, for example, be expected to depart in pure bred birds? What degree of variation, biometrically considered, do the various comb characters exhibit? The work of Weldon on peas† and on Lychnis‡ has demonstrated the importance of such studies in relation to the analytical investigation of Mendelian phenomena. All studies of this kind take their point of departure in an attempt to analyze

* Papers from the Biological Laboratory of the Maine Agricultural Experiment Station. Orono, Maine, U.S.A., No. 8.

† *Biometrika*, Vol. I. pp. 228—254.

‡ *Ibid.* Vol. II. pp. 44—55.

a broad Mendelian category. In Mendelian discussion "single comb" is a "unit character." All "single" combs are put together in one category, all "pea" combs in another. But nothing is more certain than that all single combs are not alike in respect to any feature whatsoever, even including their "singleness." How much and in what ways do they vary? Do the variants *within* the category mendelize? Are all variants exactly equivalent in crossing with other categories? An answer to these and other easily suggested questions could not fail, it seems to us, to throw light on the problem of the constitution and physiology of the gametic determinants of "unit characters," assuming that such determinants exist.

In this paper we have endeavoured to give a clear and, so far as possible, quantitative *description* of the nature and amount of variation normally occurring in a homogeneous pure bred strain of Barred Plymouth Rock hens in respect to the form and size of the comb. The aim of the paper is purely descriptive, and it is regarded by the authors as preliminary to the analytical investigation of comb inheritance.

2. Up to this time we have only been able to collect anything approaching a statistically adequate amount of material regarding comb variation for single combs alone. There is a certain fitness in taking up this comb at the start, because it is the primitive form*. In the course of the routine work of the laboratory, there came an opportunity in connection with certain autopsy work to examine and record the condition of the comb in a series of adult Barred Plymouth Rock hens. The hens from which the combs were taken for this work had been carefully and closely selected in their breeding for more than 25 years. During the last nine years they have been "line-bred." This means that no new "blood" had been introduced into the stock during that period. Consequently, the material is racially exceedingly homogeneous. Indeed it would be difficult to find anywhere material for the study of variation more homogeneous than that dealt with here. All the birds whose combs are included in this study were females, and adult. In age they varied from eleven months to about five years. The great majority of the birds were two years and over in age. Since the comb attains its full development within the first year of a hen's life and probably does not thereafter change in form—except as the result of accident or mutilation—this difference in the age of the different birds used is not significant. Mutilated combs were not included in the study.

As will presently be made clear to the reader, the comb is an exceedingly variable structure in fowls. It varies both in size and in form. So great and of such a peculiar character is this variation that its biometrical appreciation is a rather perplexing problem. *A priori* one would be inclined to say that fewer things would be easier than counting the number of points on a single comb, or measuring its height. Actually we have found it practically impossible to do

* Cf. Davenport, C. B., "Inheritance in Poultry." *Carnegie Institute of Washington.* Publ. No. 52, p. 65. "The primitive form of the comb is the single comb seen in the wild species of the genus Gallus, and in most domestic races."

either of these things directly in a satisfactory way. At the outstart of the work it was felt to be absolutely essential to get some kind of a picture of each individual comb. Practical considerations ruled photography out as a means of reaching this end. Resort was had to drawing the combs actual size with the aid of a camera lucida arranged not to magnify or distort the image. In this way one can get an accurate outline of the lateral aspect, or, more correctly, of a sagittal section of the comb. It was at first thought that it would be best to make such drawings with the comb still attached to the head. Experience showed however that this was not the case. More uniform and accurate representation of the base of the comb could be made if it was removed from the head. After this was learned all the combs were removed before they were drawn. They were cut off with a sharp scalpel, great care being taken to ensure that the cut evenly followed the contour of the top of the skull. The severed comb was put on a flat surface after removal, and the basal cut edge was made, as nearly as possible, a straight line. After the outline of each comb had been drawn, the *area* bounded by the outline of the comb was determined by means of an Amsler polar planimeter to tenths of a square centimetre. Our procedure was as follows: the area of every comb was measured twice; if the results of the two measurements did not agree, a third measurement was then taken. If this measurement agreed with one of the others, it was taken as the final result. If it did not agree with either of the other two, an average was taken of the three measurements and the average recorded as the area. Every effort was made to attain accuracy in the planimeter measurements, and it is believed that the figures given are substantially correct.

In addition to the comb area, the *length* of the comb was measured. This was done by placing a sliding arm-caliper on the outline drawings, and adjusting it so that the arms touched respectively the most anterior and posterior points of the comb outline, with the bar of the caliper parallel to the base of the comb. It was desired to measure the height of the comb, but attempts to do this directly failed. The reason for the failure will be apparent if one examines the figures. The top of the comb is an irregular, serrated line. It is quite a matter of accident which particular point of region of the comb happens to be highest. If one were to measure the height at different points in different combs, it is plain that one would not always be measuring morphologically identical or even comparable things. Thus, in one case (Fig. 27, Plate I.) the highest part of the comb might be at the very posterior end, and in another case well toward the anterior end (Fig. 93, Plate III.). Height measurements made on such a plan would have no particular significance. Yet comb-height is a very significant thing, particularly in cold climates. The tall comb (e.g., the Leghorn type) is much more liable to be frozen than is the low Plymouth Rock comb. It is highly important to get some measure of height in a study of comb variation. After a careful study of the problem we have reached the conclusion that a fairly trustworthy and significant measure of comb-height will be obtained if we take the height of a rectangle having a length and an area equal to that of the comb. We

have accordingly determined this value for each of the combs, by dividing the measured area by the measured length. The values so obtained are designated as the "calculated heights." These measurements are given in Table I. The total number of combs included is 81.

TABLE I.

Data on Comb Variation.

Comb Number	Area in cm.²	Length in mm.	Calculated height in mm.*	Comb Number	Area in cm.²	Length in mm.	Calculated height in mm.*
1	3·9	47·4	8	*57*	8·3	60·9	14
2	7·6	61·5	12	*58*	4·7	53·4	9
3	4·3	53·4	8	*59*	5·3	56·0	9
4	7·7	57·8	13	*60*	4·1	49·1	8
5	5·5	47·6	12	*61*	3·6	43·6	8
6	3·4	49·3	7	*62*	7·5	54·8	14
7	9·5	61·5	15	*63*	4·8	54·8	9
8	4·1	45·4	9	*64*	4·5	41·8	11
9	3·9	49·2	8	*65*	12·7	62·3	20
10	3·6	46·4	8	*66*	7·5	54·9	14
11	3·4	37·3	9	*67*	5·2	47·9	11
12	5·1	54·9	9	*68*	4·7	46·0	10
13	7·0	56·8	12	*69*	4·6	43·2	11
14	5·0	49·0	10	*70*	7·2	51·0	14
15	1·8	37·3	5	*71*	7·0	48·9	14
16	5·6	57·6	10	*72*	3·7	42·3	9
17	5·7	54·8	10	*73*	8·7	56·6	15
18	4·7	48·7	10	*74*	6·8	51·4	13
19	7·4	62·6	12	*75*	5·3	51·4	10
20	4·2	46·0	9	*76*	7·5	54·2	14
21	4·3	55·4	8	*77*	4·8	45·9	11
22	8·1	61·8	13	*78*	7·0	51·4	14
23	5·6	53·0	11	*79*	7·5	51·6	15
24	5·1	55·5	9	*80*	5·6	49·4	11
25	3·9	49·4	8	*81*	8·5	57·0	15
26	4·6	54·0	9	*82*	7·2	52·6	14
27	4·7	46·0	10	*83*	1·5	35·4	4
28	4·7	45·5	10	*84*	1·6	35·0	5
29	4·1	51·0	8	*85*	1·3	32·4	4
30	7·2	56·9	13	*86*	4·7	45·0	10
31	3·5	45·5	8	*87*	5·1	42·8	12
32	4·2	51·3	8	*88*	6·4	47·2	14
33	4·2	55·4	8	*89*	2·4	38·6	6
34	2·5	37·4	7	*90*	5·2	47·2	11
50	8·7	63·6	14	*91*	5·8	52·2	11
51	4·2	48·7	9	*92*	8·6	66·7	13
52	5·3	48·3	11	*93*	13·3	72·7	18
53	2·2	45·5	5	*94*	8·5	61·2	14
54	6·2	56·3	11	*95*	5·4	42·8	13
55	4·3	52·7	8	*96*	3·8	45·1	8
56	7·4	60·3	12				

3. The actual outlines of the combs studied are shown, somewhat reduced in size, in Plates I. to III. Combs 35 to 49 inclusive present a different appearance

* The values tabled are the figures to the *nearest whole number*, obtained by dividing the area by the lengths.

PLATE I.

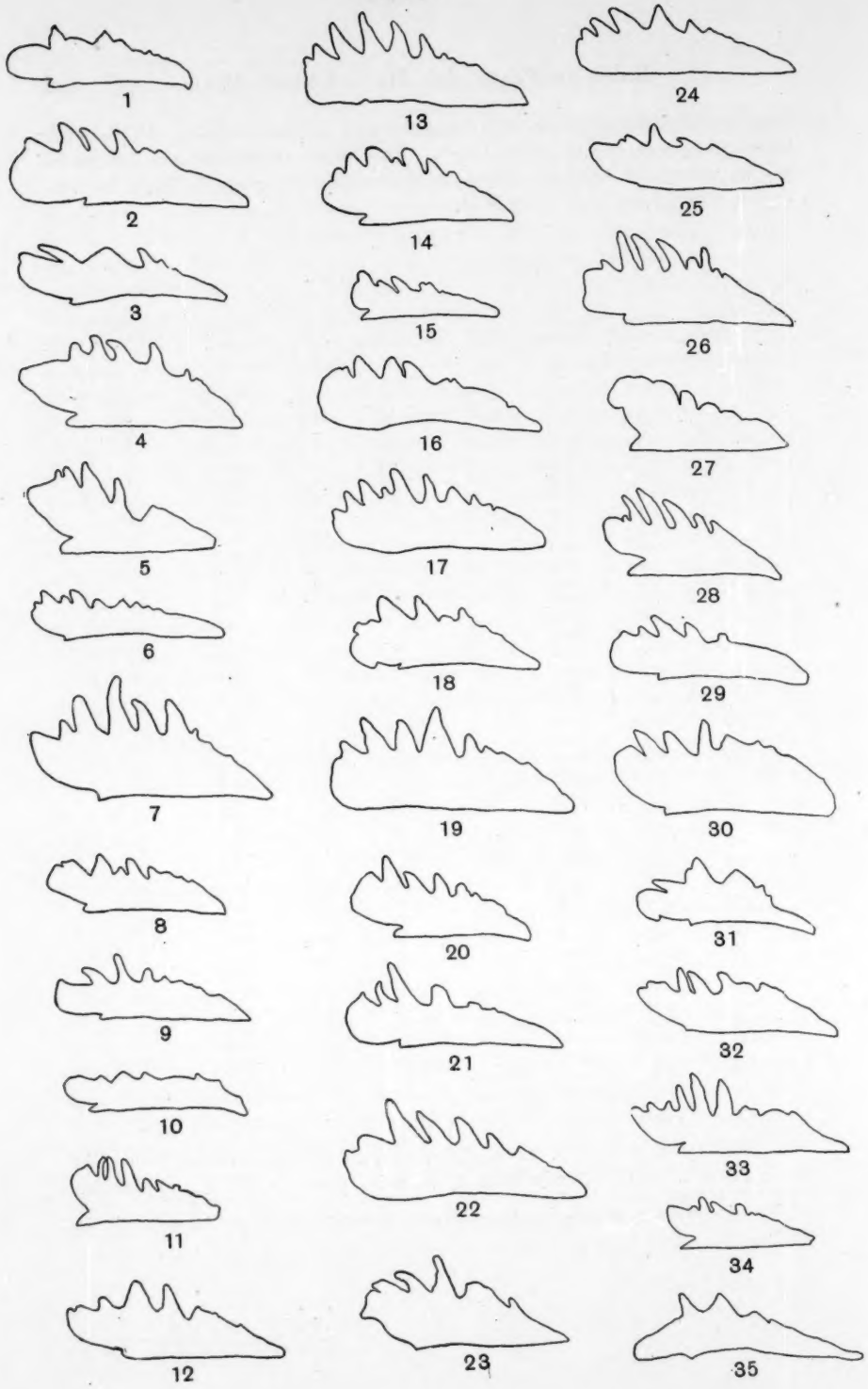

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PLATE II.

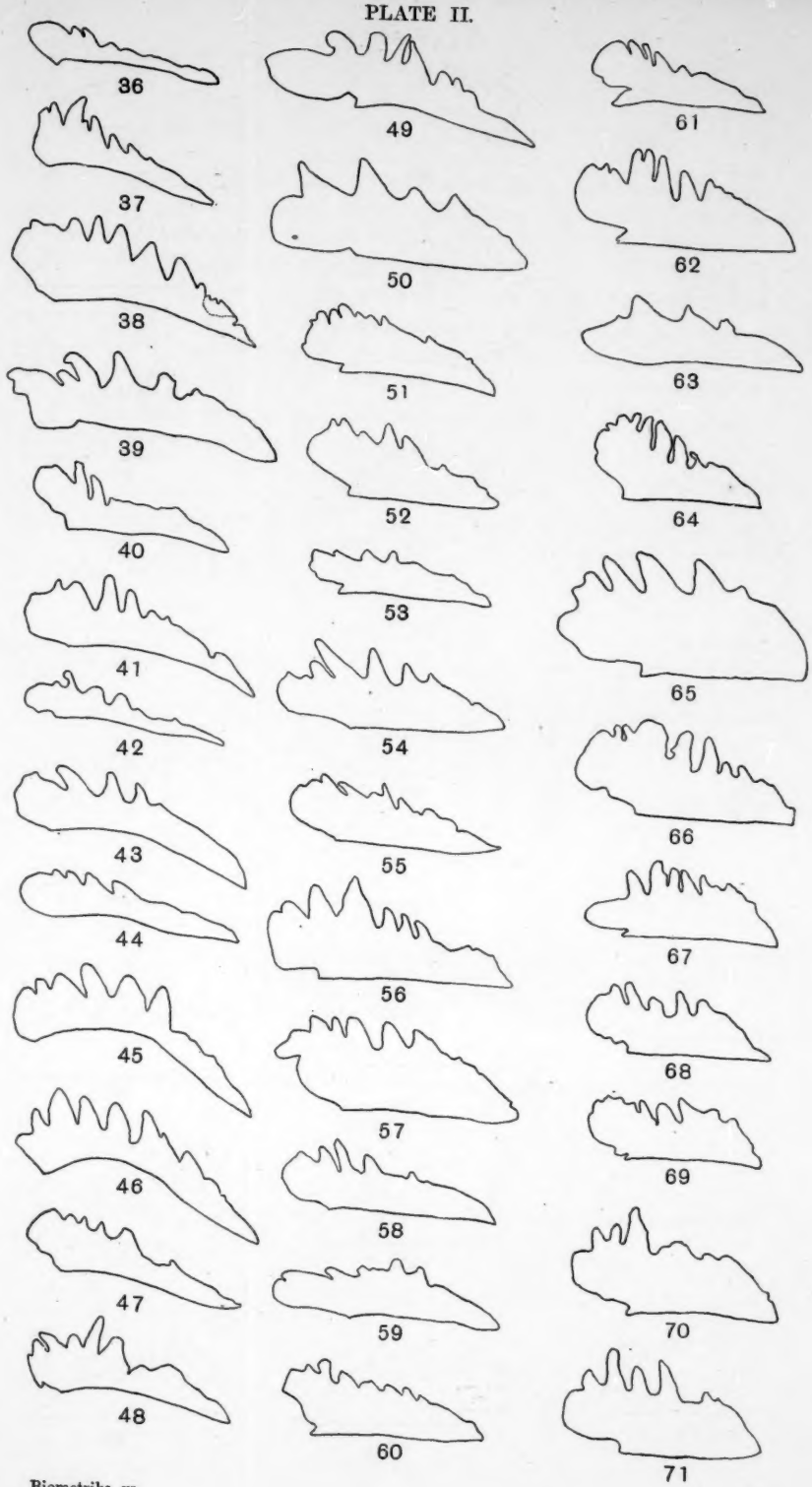
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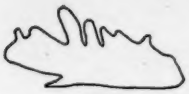
PLATE III.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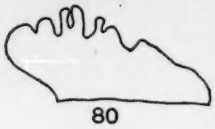
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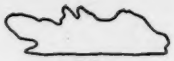
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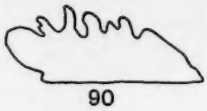
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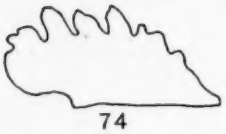
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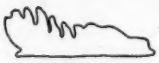
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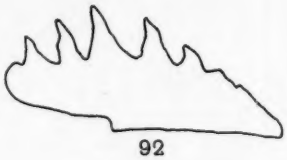
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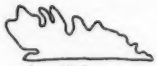
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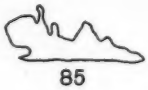
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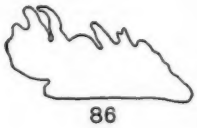
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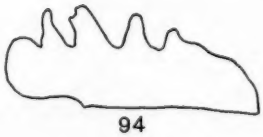
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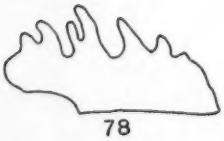
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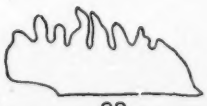
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from the others in that the base of the comb is less straight, and the comb is canted at an angle as a whole. This condition results from the fact that these combs were drawn without removal from the bird's head. It will be noted that measurements from them are not included in Table I.

An examination of these plates shows at once the extraordinary degree of variation which exists within a single comb type, even in the most homogeneous material. It is apparent that this variation involves both size and form of comb. We may first turn to a discussion of the variation in size shown in these combs.

4. The distributions of frequency for the 81 birds and the three characters measured are given in Table II.

TABLE II.

Frequency Distributions for Variation in Area, Length, and Calculated Height of Female Barred Plymouth Rock Combs.

AREA		LENGTH		CALCULATED HEIGHT	
Sq. cm.	Frequency	Mm.	Frequency	Mm.	Frequency
0·5— 1·4	1	32—34·9	1	3·5— 4·4	2
1·5— 2·4	5	35—37·9	5	4·5— 5·4	3
2·5— 3·4	3	38—40·9	1	5·5— 6·4	1
3·5— 4·4	18	41—43·9	6	6·5— 7·4	2
4·5— 5·4	21	44—46·9	11	7·5— 8·4	14
5·5— 6·4	8	47—49·9	15	8·5— 9·4	11
6·5— 7·4	9	50—52·9	10	9·5—10·4	9
7·5— 8·4	8	53—55·9	13	10·5—11·4	10
8·5— 9·4	5	56—58·9	8	11·5—12·4	6
9·5—10·4	1	59—61·9	6	12·5—13·4	6
10·5—11·4	0	62—64·9	3	13·5—14·4	11
11·5—12·4	0	65—67·9	1	14·5—15·4	4
12·5—13·4	2	68—70·9	0	15·5—16·4	0
		71—73·9	1	16·5—17·4	0
				17·5—18·4	1
				18·5—19·4	0
				19·5—20·4	1

The chief variation constants for these distributions are given in Table III.

TABLE III.

Constants of Variation in Size Characters of Single Combs.

Character	Mean	Standard Deviation	Coefficient of Variation
Area	5·59 ± ·17 cm.²	2·24 ± ·12 cm.²	39·97 ± 2·44 %
Length	50·80 ± ·56 mm.	7·45 ± ·39 mm.	14·67 ± ·79 %
Calculated Height	10·57 ± ·23 mm.	3·03 ± ·16 mm.	28·66 ± 1·64 %

From these tables the following facts are to be noted:

(1) The average area of the combs of the females of the race of Barred Plymouth Rocks here discussed is in round numbers 5½ square centimetres. The average length of comb is a little over 5 cm. This indicates an average calculated height of 10½ mm. On account of the way in which the combs were removed (cf. p. 422), this represents the average height above the top of the *skull*.

(2) There is a high degree of variation, both absolute and relative, in regard to each of the size characters studied. The Barred Plymouth Rock female according to the American Standard of Perfection* has the comb "small, proportional to the size of the specimen, set firmly on the head, straight and upright, evenly serrated, having five well-defined points, those in front and at rear being somewhat smaller and shorter than the other three." The drawings and figures here presented show that in the absence of special selection in regard to comb size, the character shows a range of variation all the way from the condition shown in large combed types like the Leghorns to the very smallest of single combs (cf. for extremes, Figs. 85 and 93 of Plate III.).

(3) The amount or degree of variation, whether measured absolutely or relatively, is not the same for the characters measured. The area shows the highest and the length the lowest coefficient of variation. This relation is to be expected from the form of the comb. The chief factor in determining variation in area is the shape of the serrated portion of the comb. The figures of Plates I. to III. show how variable in shape the combs are. It must be remembered that the comb characters studied are not independent variables†.

5. We may turn next to the consideration of variation in the shape or form of the comb. In the typical single comb such as is shown, for example in Diagram A, there are to be distinguished four regions or parts which are morphologically distinct.

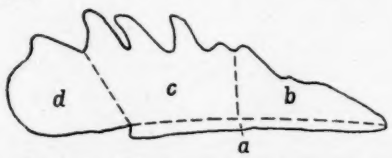


Diagram A. Outline of a typical single comb removed from the head. The dotted lines indicate distinct regions of the comb. The comb outline of this figure is a copy of Figure 2, Plate I.

These regions may be designated as follows:

(1) A *basal region* (Diagram A, *a*) forming the attachment of the comb to the top of the skull. From the base springs the *vane*, or upright portion. In the vane are to be distinguished three portions as follows:

* Published by American Poultry Association, 1906.

† The value of v_H is directly deducible from that of v_A and v_L when we know the correlation of area and length. We find for length and area correlation $r_{AL} = \cdot 845$, from $r_{AL} = (v_A^2 + v_L^2 - v_H^2)/(2v_A v_L)$.

(2) An *anterior region* (Diagram A, *b*) having its free border smooth or very slightly and irregularly serrated, typically never deeply and regularly serrated.

(3) A *middle, serrated region* (Diagram A, *c*). This is the region of the deep and characteristic serrations on the free border of the comb.

(4) A *posterior region* or *blade* (Diagram A, *d*) typically having its dorsal, posterior and ventral borders free, and lying wholly behind the posterior end of the base (*a*) of the comb.

A study of the figures in Plates I. to III. makes it evident that variation occurs in respect to each of these comb regions. A summary catalogue of these variations is presented because of its possible usefulness in classifying single comb variations in breeding work. The several regions enumerated are considered in order.

The *basal region* (*a*) may be *present* or *absent*. When present it varies in height above skull, showing all gradations between entire absence and a height of several millimetres. In some cases (for example, Figs. 16, 17 and 19) the vane is directly attached to the skull without any intervening, morphologically distinct base. In the living bird this condition most obviously manifests itself by the ventral edge of the blade lying close down to the head. This condition was observed in 6 out of the 81 combs measured.

The *anterior portion* (*b*) may vary in regard to the following particulars*:

(1) *Relative extent.* (Compare Figs. 2, 22, 30, 36, 40, 50, 65, 78 and 93.) This region reaches back over considerably more than half the length of the comb in some cases, and only a short distance in others.

(2) *Character of serration* varies all the way from a perfectly smooth free margin (Figs. 2, 29, 43 and 63) through a condition of fine and regular serration (Figs. 8, 9, 62, 84 and 86) to a condition of coarse and irregular points in this region of the comb (Fig. 75).

(3) *General shape* varies from the condition in which the free border is generally convex (Figs. 29, 30, 54, 63, 69, 70, 93, 94) through the condition where the border is approximately straight (Figs. 7, 12, 26, 28) to the concave or excavated border (Figs. 23, 31 and 33).

The *middle or serrated portion* (*c*) may vary in respect to:

(1) *The depth of the serrations.* The serrations may be broad and deep (Figs. 13, 19, 24, 92 and 94), or broad and shallow (Figs. 10 and 89), or narrow and deep (Figs. 11, 26, 75, 88 and 96), or, finally, they may be shallow and narrow (that is set close together, Figs. 27 and 51). All degrees of gradation between these classes are represented among the combs.

* It is to be understood that the references to figures given in parentheses in this section are intended merely as illustrations, and not as complete, statistical inventories of all the combs falling within each of the several categories. The attempt is made simply to refer to several clear illustrations of each class.

(2) *Number of points.* While, as is evident from an inspection of the figures, it is impossible accurately to count the number of points in each comb, owing to the difficulty in defining how great the projection of the margin must be in order to be designated as a point, yet it is obvious that there is a great deal of variation in regard to this character. Such combs as are shown in Figs. 7, 17, 26, 64, 73, 76 and 88 obviously have more points than do such combs as are shown in Figs. 3, 12, 18, 31, 44, 50, 63, 89 and 94. There is further no doubt that there is continuous variation between the extremes in respect to the number of points.

(3) *The extent of the serrated region.* The region of large and distinct points may extend over nearly the whole of the comb (Figs. 7, 22, 38, 46, 88 and 93), or it may be confined to a restricted region of the comb (Figs. 29, 33 and 58).

(4) *The direction of the points.* The angle which the points make with the base line of the comb varies in a continuous manner from the condition in which they form approximately a right angle with the comb base (Figs. 7, 62, 64, 66 and 96), to the condition where they slope in a posterior direction at a pronounced angle (Figs. 2, 13, 15, 22, 28 and 65) or to the condition where they point forward (Figs. 48 and 77).

(5) *Intercalated points.* It happens rather frequently in the single comb that a small point or serration will be set between two larger ones in the series. Examples of such intercalation are shown in Figs. 8, 14 and 17.

(6) *Branched or split points, and points with spurs.* The combs studied rather frequently have one or more of the points either branched or split at the tip, or bearing on either the anterior or the posterior side a small spur or secondary point. Examples of this sort of point variation are seen in Figs. 37, 46, 62, 66, 78, 79, 80, 82, 86, 88, 90, 91 and 94.

The *blade of the comb* (*d*) varies in respect to:

(1) *The condition of the dorsal free margin or border.* This margin of the blade may be smooth (Figs. 4, 5, 10, 30, 49, 50, 82 and 94) or it may be serrated (Figs. 7, 12, 21, 22, 26, 33, 56, 69, 75 and 76).

(2) *The contour of the posterior and ventral free borders.* These borders of the blade may be either smooth (condition shown in the majority of the figures) or they may be to a greater or less extent indented and of irregular contour (Figs. 12, 23, 31, 39, 48, 51 and 61).

(3) *The degree of extension behind the posterior end of the base of the comb.* The blade may lie nearly or wholly behind the posterior end of the comb base as in the normal case (shown in the majority of the figures), or, on the other hand, little or none of the blade may lie behind this point (Figs. 11, 15, 37, 77, 83, 84, 85 and 95). There are all intergrades between these extreme conditions.

(4) *The angle made with the base of the comb.* The blade may be set on the comb in such a way that its chief axis is approximately in line with the chief axis of the comb (Figs. 4, 9, 10, 26, 42, 49, 50, 67 and 94), or it may be tilted up so that its axis forms different angles with the rest of the comb (Figs. 3, 8, 11, 15, 20, 30, 32, 62, 64, 77, 80 and 87). It is even possible that the blade may be tilted downward with reference to the rest of the comb as is shown, for example, in Fig. 35.

6. The comb as a whole may vary in form in certain other respects beyond those enumerated. Some of these variations are not shown in the series of figures here presented. Among such variations are to be included lopping of the comb, such as is a normal breed characteristic of Leghorn hens, and of other breeds having a very large single comb. The comb may also be wrinkled or puckered. This condition is brought about when the area of the vane of the comb is too great for the base, and consequently puckering of the free border of the vane occurs. An example of this condition is indicated by the dotted line in Fig. 38.

Another variation of the single comb is that in which side sprigs or points occur. Examples of this variation are shown in Figs. 73 and 76. These side sprigs occur with tolerable frequency among single comb breeds of fowls. They usually appear more often in the males than in the females. The fancier must constantly be on his guard to keep this form of comb from appearing among his exhibition birds. The occurrence of this comb variant is of particular interest from the theoretical side, because there is strong reason to regard it as an incipient transitional or intermediate form between the pure single and the pure pea types of comb. The pea comb differs from the single comb in that in addition to a central ridge corresponding to the vane of the single comb, it has two lateral serrated ridges of comb substance. Neither the central nor the lateral ridges of the pea comb are nearly as high as is the vane of the single comb. The low, compact form of the pea comb is one of the characteristic features which distinguish it from the single comb. Side sprigs occurring on the single comb appear in just the place where the lateral ridges of the pea comb lie in the corresponding region of the comb. Davenport (*loc. cit.* p. 66) says of them: "Now such side sprigs are morphologically equivalent to the lateral ridges of the pea comb." When the side sprigs are present, they are usually found near the posterior end of the comb. It is a well-known fact to breeders who handle pea comb birds that when the pea comb is partially defective it is usually at the posterior end alone that the three ridges (central and two laterals) are found.

That intermediate forms between the pea comb and the single comb occur has been known for some time. In 1902 Bateson*, in describing the results of crossing White Leghorns (single comb) and Indian Games (pea comb) says: "In the cross-bred the comb is almost always either a true single comb, differing from the White Leghorn in diminution of size; or an intermediate pea. Of the latter there are

* Report to the Evolution Committee of the Royal Society. Report I, 1902, p. 94.

many degrees." In a further paragraph, he says: "In later life the distinction between intermediate and single may become very obvious; but even though the comb may grow up to some height, the three ridges of the pea comb remain marked. The intermediate pea comb in both sexes usually lies either on one side or the other, like that of the Leghorn hen." The existence of intermediates between these comb types has been confirmed by Davenport (*loc. cit.*), who says (p. 35), in discussing the comb form of B. Minorca × Brahma hybrids: "In all cases the pea comb of the Brahma dominates over the single comb. Critical examination shows, however, that the pea comb of the hybrid is not always typical. Frequently the whole structure, and especially the median ridge, is abnormally high (Fig. 21), and, on the other hand, in a few cases the lateral ridges are hard to make out. The dominance is imperfect." Such intermediates between single and pea combs are very well shown in Davenport's Figs. 20 and 21.

We have obtained the same result in our own hybridizing experiments with single and pea comb crosses. In the F_1 hybrids the combs frequently are high and have a deeply serrated dorsal border. Such a condition is never found, so far as we are aware, in fowls pure bred in respect to pea comb. At the same time, these hybrid birds exhibit unmistakable traces of the lateral ridges which are typical of the pea comb. It would be hard to conceive of a more perfect intermediate form between the pea and the single comb type than is afforded by such birds.

Summarizing the facts brought out by the inventory of qualitative variations exhibited in these combs it may be said that there appears to be continuous variation, considerable in amount, in every definable characteristic of the comb. All degrees of intergradation between the extreme conditions of each of these characteristics regularly occur.

EXPLANATION OF PLATES.

All figures are reduced to one-third.

Plate I. Outlines of Combs 1 to 35.
Plate II. Outlines of Combs 36 to 71.
Plate III. Outlines of Combs 72 to 96.

MISCELLANEA.

I. Fecundity of Swine*.

By FRANK M. SURFACE, Ph.D.

During the course of certain investigations in the laboratory of the Maine Agricultural Experimental Station it became desirable for purposes of comparison to have data on other fecundity distributions than those already accessible in the literature. In this connection it was decided to fit frequency curves to the data published some time ago by Mr George Rommel† on the fecundity of brood sows. A large amount of data relating to the size of litters produced by registered sows of two breeds, Duroc Jersey and Poland China, had been extracted from the stud books and published by this writer. The raw material is given in the form of frequency distributions for single years. In the case of the Poland China sows the statistics were taken from two sources: viz., the American Poland China Record and the Ohio Poland China Record. In each case two five year periods, 1882–1886 and 1898–1902, were selected for comparison. Tables I, II, IV and V of the above-mentioned circular give the raw data for each year as obtained from the two sources.

For the Duroc Jersey data the National Duroc Jersey Record was used. Tables VIII, IX and X give the number and size of litters registered for each of the fifteen consecutive years from 1888 to 1902. In this case the earlier years contained relatively few records.

In all cases however, and especially for the later years, the number of litters dealt with was very large. For this reason the statistics are of considerable value. No reductions other than the means for each year were given in the original paper. Later Rommel and Phillips‡ in a similar set of data for the year 1902 studied the inheritance of size of litter from Poland China sows. In the course of this work the standard deviations and coefficients of correlation were determined. The data with which the present paper deals have never been reduced although the variation constants in the case of Poland China sows are, as would be expected, of the same order of magnitude as those found by Rommel and Phillips. The reductions given here were originally made for the purpose of comparison with other data then being studied, but it seems worth while to put these constants on record. To do so is the purpose of this paper.

The data for a single year for each breed were picked out and submitted to analysis. In each case the year selected was that which contained the largest number of litters. For the Poland China the data given by the American Poland China Record for 1902 were used. The number of litters recorded in this year was 6,627. In the case of the Duroc Jersey breed the records given by the National Duroc Jersey Record for the same year, 1902, were used. The number of litters recorded in this case was 6,109.

* Papers from the Biological Laboratory of the Maine Agricultural Experiment Station, No. 3.

† Circular, No. 95. Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D.C. 1906.

‡ *Proceedings of American Philosophical Society*, Vol. XLV. pp. 245—254, 1907.

The chief constants measuring the variability in the fecundity of these two breeds for the year 1902 are given in Table I.

TABLE I.

Constants for Variation of Fecundity in Brood Sows.

Constant	Poland China	Duroc Jersey
Mean	7·435 ± ·010	9·337 ± ·021
Standard Deviation ...	2·038 ± ·013	2·427 ± ·016
Coefficient of Variation ...	27·411 ± ·172	25·997 ± ·169

The first thing noted here is the large difference in the values of the means. This, as Rommel has pointed out, confirms the common observation that Duroc Jersey sows are more prolific than the Poland China. The difference of almost two pigs is very marked. In the constants measuring the variability of the two breeds only a small difference is found. The standard deviation is slightly larger in the Duroc Jersey. When considered with reference to the mean, however, it is seen that the coefficient of variation is larger in the Poland China by nearly 1·5 per cent. This when taken in connection with its probable error, which for the difference of these two quantities is ±0·241, is to be regarded as certainly significant.

Considering the coefficient of variation with reference to fecundity in other animals we find that this value is somewhat lower than the average. Fecundity like many other physiological characters appears to have a high coefficient of variability. Powys* finds that for man the number of children exhibits a coefficient of more than 48 °/₀. For the horse Pearson† finds a value slightly less than 25 °/₀. For mice the data given by Weldon‡ lead to a coefficient of variation of 37·5 °/₀. In the case of ovulation of the domestic hen§ the coefficient of variation averages 34·2 °/₀.

Table II gives the analytical constants which exhibit the further characteristics of these distributions. The material was not grouped, nor were Sheppard's corrections used. The unit for the moments is one pig.

It may first be noted that for the skewness shown by these distributions we have the values of +0·05 and +0·07. The probable error for each is ±0·01. Thus there is a small but significant positive skewness. The Poland China with the smaller mean and larger variability shows a slightly larger skewness. However, the difference is so slight that it cannot be regarded as very important. Comparing the skewness of these distributions with fecundity and fertility curves for other organisms, we find that it is of about the same magnitude as that given by Powys for man, viz. +0·08‖. Schuster**, however, gives data for the size of human families with one or more congenitally deaf persons, which lead to a skewness of about +0·43. For fecundity of mares Pearson gives a value of nearly −0·13. In the domestic hen the skewness has an average value of −0·21.

* *Biometrika*, Vol. IV. p. 251, 1905. [Various values from 47 to 70 are deducible from Pearson and Lee's data, *Phil. Trans.* 1899, Vol. 192, A, pp. 280—90.]

† *Biometrika*, Vol. I. pp. 289—292, 1902. Only the moments are given here.

‡ *Biometrika*, Vol. V. p. 442, 1907.

§ Pearl, R. and Surface, F. M. In a bulletin of the Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D.C., now in press.

‖ [There appears to be a slip here. Powys' only comparable data occur *Biometrika*, Vol. IV. p. 251 and give skewness = ·38, and this does not wholly exclude the sterile cases as in the sow data. ED.]

** *Biometrika*, Vol. IV. 1906, p. 474. [Pearson's data give Anglo-Saxons ·56, Danes ·42, *Chances of Death*, Vol. I. pp. 75—88, 1897.]

TABLE II.

Analytical Constants for Variation of Fecundity in Brood Sows.

Constant	Poland China	Duroc Jersey
μ_2	4·1538	5·8922
μ_3	1·4259	1·8494
μ_4	58·0100	116·1018
β_1	·0284	·0167
$\sqrt{\beta_1}$	·1684	·1293
β_2	3·3622	3·3442
β_2-3	·3622	·3442
κ_1	·6392	·6381
κ_2	·0336	·0198
Skewness	·0701	·0539
Modal divergence ...	·1429	·1308
Standard deviation .	2·0381	2·4274
Mean	7·4353	9·3372
Median	7·8754*	9·7631*
Mode	7·2924	9·2064
Modal frequency ...	1344·04	1039·0000
Origin	5·7270	7·7770
y_0	950·2781	850·5350

The modal divergence has values of 0·131 and 0·143, and the probable errors of these quantities on the assumption of normality are ±0·026 and ±0·021 respectively. Since the lower value is more than five times its probable error, there can be no doubt that we are dealing with skew variation.

Turning to the kurtosis, it is seen that β_2-3 is positive and equal to about 0·35. The probable error of β_2 on the assumption of a normal distribution is ±0·04 for the two cases. This indicates that these curves are significantly leptokurtic. The deviation from the mesokurtic condition of the normal curve is more than eight times its probable error.

Since $\kappa_1\,(=2\beta_2-3\beta_1-6)$ is positive and κ_2 greater than 0 and less than 1 we have the conditions for a Type IV curve in each case. The equations to the two curves are as follows:

For the Poland China

$$y=\frac{950{\cdot}2781}{\left[1+\left(\frac{x}{9{\cdot}1609}\right)^2\right]^{11{\cdot}9532}}\cdot e^{4{\cdot}0851\tan^{-1}x/9{\cdot}1609}.$$

For the Duroc Jersey

$$y=\frac{850{\cdot}5350}{\left[1+\left(\frac{x}{10{\cdot}9825}\right)^2\right]^{11{\cdot}9415}}\cdot e^{3{\cdot}1088\tan^{-1}x/10{\cdot}9825}.$$

The frequency polygons and fitted curves for these two distributions are shown in Figures 1 and 2 respectively (p. 436). The graduation is very close in both cases. The distributions for several other years were calculated far enough to determine that they would lead to the same type of curve. This indicates that the present curves give us the manner of the distribution of fecundity as measured by size of litter in these breeds of swine. So far as the writer knows, distributions of fecundity in other organisms have led to either Type I or Type II (or occasionally to a normal curve). That is to say, from the meagre data at present available it would appear that fecundity distributions do not usually lead to skew curves with unlimited range in both directions, but on the contrary to some type of limited range curve.

* These are the *observed* values of the median.

FIG. 1. Frequency histogram and fitted curve for variation of fecundity of Poland China sows.

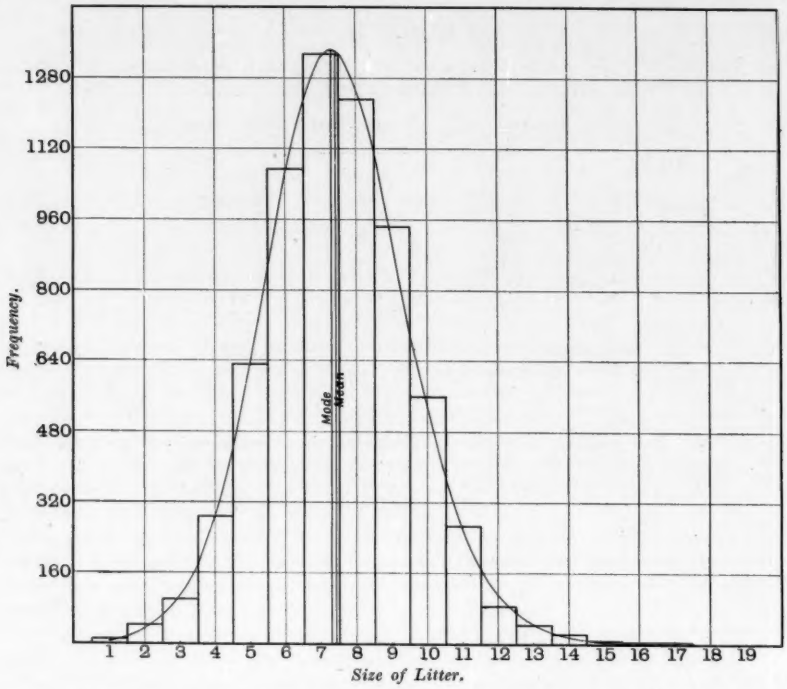
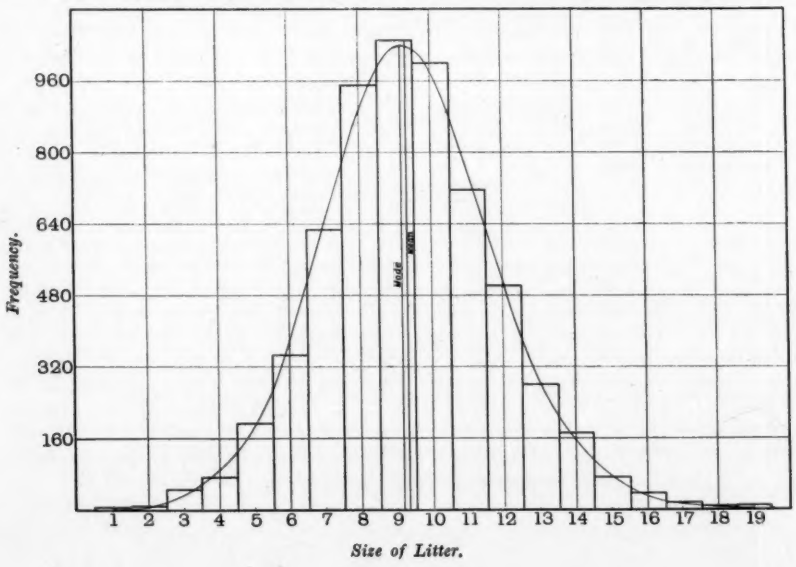


FIG. 2. Frequency histogram and fitted curve for variation of fecundity of Duroc Jersey sows.



II. The Frequency Constants of a Variable $z = f(x_1, x_2)$*.

By RAYMOND PEARL, Ph.D.

It often happens in practical biometric work that one desires to find the frequency constants of a compound character, from a previous knowledge of the constants of the separate components. Thus, for example, one measures the length, the breadth, and the height of each of a series of skulls. He wishes to know at least the mean and the standard deviation of the diametral product ($L \times B \times H$). There are two ways open to find the values of these constants. On the one hand the length, breadth, and height may be multiplied together for each individual skull, a frequency distribution of the products made, and the constants calculated in the ordinary way; or, on the other hand, by the use of the appropriate formulae one can deduce straight off the constants for the product knowing those for the components which enter into the product. The latter procedure will obviously effect a great saving of labour.

The formulae for determining the mean and standard deviation of a character $z = f(x_1, x_2)$ when the same constants and the coefficient of correlation for x_1 and x_2 are known, are well known to mathematicians. The writer ventures to think, however, that they are not so familiar to many of those who have approached the field of biometry along the biological pathway. For the convenience of such it seems desirable to publish all together those formulae of the sort under discussion which are most likely to be used in practical work.

The general method of deducing these formulae will be clear to anyone who will carefully study Pearson's paper "On a Form of Spurious Correlation which may arise when Indices are used in the Measurement of Organs†," wherein the formulae for $z = \frac{x_1}{x_2}$ are discussed. The general formulae for $z = f(x, y)$ will also be found discussed in the *Phil. Trans.* Vol. 187 A, p. 278, 1896.

In the formulae given in Table I the various letters have the following meanings:

x_1, x_2 and x_3 the separate characters involved in the compound character z.

m_1, m_2 and m_3 the means of the characters x_1, x_2 and x_3.

σ_1, σ_2 and σ_3 the standard deviations of x_1, x_2 and x_3.

$v_1 = \frac{\sigma_1}{m_1}$, $v_2 = \frac{\sigma_2}{m_2}$, $v_3 = \frac{\sigma_3}{m_3}$. (The v's are the ordinary coefficients of variation *divided by* 100.)

r denotes the coefficient of correlation between the two characters designated by the subscripts.

The table gives the formulae for the mean and standard deviation of

(*a*) the sum of two and of three variables,

(*b*) the difference of two variables,

(*c*) the product of two and of three variables,

(*d*) the quotient of two variables (index).

In certain of the cases the formulae are approximations, but very close ones. The nature of the approximations made is indicated in the table.

* Papers from the Biological Laboratory of the Maine Agricultural Experiment Station, No. 4.

† *Proc. Roy. Soc.* Vol. 60, pp. 489—498, 1897.

TABLE I.

Constants of $z=f(x_1,\ x_2)$.

$z=f(x_1,\ x_2)$	Mean of z	Standard Deviation of z
$z=x_1+x_2$	m_1+m_2	$\sqrt{(\sigma_1^2+\sigma_2^2+2r_{12}\sigma_1\sigma_2)}$
$z=x_1+x_2+x_3$	$m_1+m_2+m_3$	$\sqrt{(\sigma_1^2+\sigma_2^2+\sigma_3^2+2r_{12}\sigma_1\sigma_2+2r_{13}\sigma_1\sigma_3+2r_{23}\sigma_2\sigma_3)}$
$z=x_1-x_2$	m_1-m_2	$\sqrt{(\sigma_1^2+\sigma_2^2-2r_{12}\sigma_1\sigma_2)}$
$z=x_1.x_2$	$m_1m_2+r_{12}\sigma_1\sigma_2$	$m_1m_2[v_1^2+v_2^2+2r_{12}v_1v_2+v_1^2v_2^2(1+r_{12})]^{\frac{1}{2}}$,* or approximately $m_1m_2[v_1^2+v_2^2+2r_{12}v_1v_2]^{\frac{1}{2}}$
$z=x_1.x_2.x_3$	$m_1m_2m_3[1+r_{12}v_1v_2+r_{13}v_1v_3+r_{23}v_2v_3]$	$m_1m_2m_3[v_1^2+v_2^2+v_3^2+2r_{12}v_1v_2+2r_{13}v_1v_3+2r_{23}v_2v_3]^{\frac{1}{2}}$ approximately
$z=\frac{x_1}{x_2}$	$\frac{m_1}{m_2}(1+v_2^2-r_{12}v_1v_2)$	$\frac{m_1}{m_2}\sqrt{(v_1^2+v_2^2-2r_{12}v_1v_2)}$

III. The Correlation between a Variable and the Deviation of a Dependent Variable from its Probable Value.

By J. ARTHUR HARRIS, Ph.D., Carnegie Institute, Station for Experimental Evolution, Long Island, U.S., and Biometric Laboratory, University College, London.

The degree of interdependence of two quantitatively measurable variables is conveniently expressed by the correlation coefficient, r, or the correlation ratio, η. These constants will both be used with increasing frequency to describe many relationships in evolutionary, morphological and physiological work.

There appear to be, however, certain problems in which the correlation coefficient, while indispensable, does not yield all the information which we require.

Take such a case as the relationship between the number of eggs per clutch and the number of birds hatching. The limits of the number of birds hatching per nest are fixed by the number of eggs laid, and it may be designated as the dependent variable. It is quite clear that if a fixed proportion of the eggs hatched the correlation between the number of eggs and the number of birds would be perfect.

The biologist can suggest many analogous cases; for instance number of flowers per inflorescence and number of fruits developing, number of ovules formed and number of seeds maturing.

[* This formula, given by me to Mr J. F. Tocher, depends on the assumption of normal correlation, see *Biometrika*, Vol. IV. p. 320. The approximate value depends on neglecting higher powers of the coefficients of variation. The formula for the mean of the double product (Tocher, *loc. cit.*) is exact. The formula for the mean of the triple product is not exact, any more than the formula for the S.D. of the triple product (see Tocher, *loc. cit.* p. 321). The formulae for the mean and S.D. of an index are only true to the lowest powers in v_1 and v_2, and must not be applied if v_1 and v_2 are large. The formulae for $z=x_1\pm x_2$, the sums or differences of any number of variables, are of course exact for both mean and S.D. Ed.]

The interpretation of the correlations between such characters as these demands a little caution. Suppose we have a series of coefficients of correlation for number of ovules formed and number of seeds developing per pod in various species. It will be quite clear that the species in which the value of r is the highest are those in which the number of ovules per pod has the largest influence upon the number of seeds developing per pod, but we are not at all justified in concluding for any individual series that the pods with the larger number of ovules have a greater, or less, capacity, relative to the number of ovules they produce, for maturing seed.

Suppose that we have a population of individuals in which we recognize the two characters, x and y, and that y is merely a proportion of x which varies from individual to individual. Our problem is to determine whether the relative value of y changes from the lower to the higher grades of x.

Clearly the most probable value of y for any individual is px, where

$$p = \bar{y}/\bar{x},$$

and $\bar{x}$ and $\bar{y}$ are the mean values of the two characters in the whole population. Now we may take $z = y - px$, or the deviation of the y of any individual from its most probable value. If we can discover the correlation between x and z we shall have a convenient measure of any organic influence which x may have upon the relative value of y. It is undesirable to correlate x with the ratio y/x because of the spurious correlation which it introduces.

Using the differential notation to represent variations, we get

$$\delta x \delta z = \delta x (\delta y - p \delta x),$$

and summing and dividing by the number of pairs, we have

$$\sigma_x \sigma_z r_{xz} = \sigma_x \sigma_y r_{xy} - p \sigma_x^2.$$

Hence

$$r_{xz} = \frac{\sigma_y r_{xy} - p\sigma_x}{\sqrt{\sigma_y^2 + p^2\sigma_x^2 - 2p\sigma_x \sigma_y r_{xy}}} \quad \text{.....(i).}$$

If $r_{xz}=0$, or y be proportional to x in every case, then

$$r_{xy} = \frac{p\sigma_x}{\sigma_y} = \frac{V_x}{V_y} \quad \text{.....(ii).}$$

Of course (ii) will never be absolutely true in practice. It gives, however, a quick test of the sign of the correlation coefficient r_{xz}. When $V_x/V_y < r_{xy}$ the correlation r_{xz} is positive and when $V_x/V_y > r_{xy}$ it is negative.

(i) may be written

$$r_{xz} = \frac{V_y r_{xy} - V_x}{\sqrt{V_x^2 + V_y^2 - 2V_x V_y r_{xy}}} = \frac{r_{xy} - V_x/V_y}{\sqrt{1 + (V_x/V_y)^2 - 2(V_x/V_y) r_{xy}}} = \frac{r_{xy} - V_x/V_y}{\sqrt{1 - r_{xy}^2 + (r_{xy} - V_x/V_y)^2}} \quad \text{.....(iii).}$$

For practical purposes (iii) is the most convenient formula to use in calculations. V_x and V_y are usually wanted for other purposes and will have been calculated already. The value for $1 - r_{xy}^2$ will have been calculated already in obtaining the probable error of r_{xy}. Beyond this the calculation of r_{xz} can be completed in a few minutes if formula (iii) be adopted.

This formula has already been rather extensively used in series of data which will be published shortly, but I give the following illustrations of the kind of problems to which it may be applied.

Illustration I. Correlation between the number of flowers per inflorescence and the number of developing fruits in *Staphylea trifolia*.

Table I. shows the correlation between the number of flowers formed and the number of immature fruits at the time of counting for 270 inflorescences of *Staphylea trifolia* from the North American Tract of the Missouri Botanical Garden. The countings of the number of flowers and fruits were made incidentally while an investigation of the development of the fruit was being carried on. The series is a short one and represents the inflorescences at

TABLE I.

Staphylea trifolia.

Flowers per Inflorescence.

Developing Fruits.	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	Totals
1	3	—	3	2	2	3	3	2	1	4	1	2	2	1	1	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	32
2	—	10	4	5	5	5	15	7	1	6	3	4	2	—	—	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	70
3	—	—	14	6	3	6	9	7	4	4	—	1	2	—	—	—	1	1	1	—	—	—	—	—	—	—	—	1	—	—	—	60
4	—	—	—	10	2	3	4	2	3	5	1	4	2	—	1	—	1	—	—	—	—	1	2	—	—	—	—	—	—	—	—	41
5	—	—	—	—	4	2	4	3	2	3	3	4	1	1	1	1	—	—	—	—	—	—	1	—	—	—	—	1	—	—	2	33
6	—	—	—	—	—	4	1	—	2	1	—	1	—	—	1	—	1	—	—	—	2	—	—	—	—	—	—	1	—	1	—	15
7	—	—	—	—	—	—	—	2	—	—	—	1	—	1	1	1	2	—	—	1	1	—	—	—	—	—	—	—	1	—	—	11
8	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	5
9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	2
Totals	3	10	21	23	16	23	36	23	13	23	8	19	9	3	5	3	7	2	2	4	3	2	3	1	0	0	1	3	1	1	2	270

a time when no fruits had attained a length of over 20 mm. It is quite probable that many of the fruits which were still developing when the material was examined would have fallen later. Thus while the investigation of the relationship between the number of flowers and the number of fruits developing per inflorescence during the time that the ovaries which fail to develop are being eliminated presents some points of particular interest, conclusions drawn from one series cannot be applied to any other of the same species. The series is here given merely as an illustration of a statistical method.

Number of flowers furnishes our x character and number of fruits developing our y character. For constants we get

Mean x	$= 9{\cdot}193 \pm {\cdot}243$,	Mean y	$= 3{\cdot}396 \pm {\cdot}074$,
S. D. x	$= 5{\cdot}924 \pm {\cdot}172$,	S. D. y	$= 1{\cdot}801 \pm {\cdot}052$,
V_x	$= 64{\cdot}444$,	V_y	$= 53{\cdot}038$,
p	$= {\cdot}369$,	V_x/V_y	$= 1{\cdot}215$,
r_{xy}	$= {\cdot}457 \pm {\cdot}033$.	r_{xx}	$= -{\cdot}649 \pm {\cdot}024$.

These figures seem to indicate that while there is a positive correlation of ·457 between the number of flowers per inflorescence and the number of fruits developing, the inflorescences are not all affected alike in the large elimination of ovaries which takes place. Only a portion of the flowers formed can develop into fruits, and the negative correlation of $-{\cdot}649$ seems to show that the larger inflorescences lose not only actually but *relatively* more of their ovaries than do the smaller ones. But this conclusion can be applied only to this particular series of data. It may be found later that after the elimination is complete the correlation between the number of flowers and the deviation of the number of fruits per inflorescence from their probable number will rise to sensibly 0, or take a substantial positive value.

Illustration II. Correlation between the number of ovules per pod and the number of seeds developing per pod in *Robinia Pseudacacia.*

The relationship between the number of ovules and the number of seeds in a sample of 1427 pods of the black locust collected from 12 trees near Lawrence, Kansas, in the fall of 1905, is shown in Table II. The constants which interest us here are :

x	= Ovules,	y	= Seeds,
Mean x	$= 12{\cdot}1794$,	Mean y	$= 7{\cdot}6874$,
S. D. x	$= 2{\cdot}2763$,	S. D. y	$= 3{\cdot}4938$,
V_x	$= 18{\cdot}690$,	V_y	$= 45{\cdot}448$,
		V_x/V_y	$= {\cdot}4112$,
r_{xy}	$= {\cdot}693 \pm {\cdot}009$.	r_{xx}	$= {\cdot}365 \pm {\cdot}015$.

Here it appears from the substantial positive value of r_{xx} that the pods with the larger numbers of ovules are relatively more capable of maturing their seeds than those with fewer. But I may add that this is not true in the case of each individual tree, so that more data are necessary before we are justified in extending this conclusion to the species at large. Evidence from another leguminous plant will be of interest in this connection.

Illustration III. Correlation between the number of ovules per pod and the number of seeds developing per pod in *Cercis Canadensis.*

Table III. is extracted from a forthcoming memoir on fertility in *Cercis Canadensis.* The correlations are :

x = Ovules,	y = Seeds,
$r_{xy} = {\cdot}6855 \pm {\cdot}0046$.	$r_{xx} = {\cdot}0070 \pm {\cdot}0087$.

Here r_{xx} is so close to 0 that there seems little doubt that there is essentially no relationship between the number of ovules per pod and the capacity of the pod for maturing its seeds. This point will be discussed in detail in the memoir.

TABLE II.

Robinia Pseudacacia.

Seeds per Pod.

Ovules per Pod.	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	Totals
6	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
7	1	1	3	2	4	—	—	—	—	—	—	—	—	—	—	—	—	—	11
8	1	5	4	8	4	6	2	—	—	—	—	—	—	—	—	—	—	—	30
9	9	9	28	15	7	19	6	10	—	—	—	—	—	—	—	—	—	—	103
10	6	33	27	38	38	23	17	12	5	—	—	—	—	—	—	—	—	—	199
11	5	25	36	39	34	41	36	12	11	6	—	—	—	—	—	—	—	—	245
12	3	16	35	33	39	32	36	19	21	15	9	—	—	—	—	—	—	—	258
13	2	8	14	17	31	28	33	23	19	20	10	10	—	—	—	—	—	—	215
14	1	1	4	4	8	10	15	12	23	14	18	9	16	—	—	—	—	—	135
15	1	1	—	3	1	3	8	6	12	18	14	15	8	9	—	—	—	—	99
16	—	—	1	—	—	—	2	3	4	9	14	7	8	9	14	—	—	—	71
17	—	—	—	2	1	—	—	1	1	3	2	—	4	4	5	9	—	—	32
18	—	—	—	—	—	—	—	—	1	3	2	1	1	1	3	2	6	—	20
19	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	1	1	2	7
Totals	29	100	152	161	168	162	155	98	97	88	69	44	38	23	22	12	7	2	1427

TABLE III.

Cercis Canadensis.

Seeds per Pod.

Ovules per Pod.	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	Totals
2	3	31	—	—	—	—	—	—	34
3	34	176	300	—	—	—	—	—	510
4	37	226	885	1093	—	—	—	—	2241
5	17	71	310	784	1040	—	—	—	2222
6	4	14	54	153	288	375	—	—	888
7	—	1	4	9	15	33	39	—	101
8	—	—	—	1	—	1	—	2	4
Totals	95	519	1553	2040	1343	409	39	2	6000

Illustration IV. Correlation between the number of flowers per inflorescence and the number of synanthous flowers in *Spiraea Van Houtii.*

"Excess of nutrition" has been the explanation offered hundreds of times for plant abnormalities. It seems desirable, therefore, to try to correlate the presence of abnormalities with the magnitude of other organs of the plant in order to see whether they are more frequent in cases in which the organs of the individual have reached an abnormal size. An example of this kind of problem is taken from my notes on abnormalities in the inflorescence of the garden species, *Spiraea Van Houtii.*

The particular abnormality here considered is that frequently designated as synanthy in teratological literature. In the inflorescence of this species the pedicels of two or more flowers are frequently found fused for their entire length. The flowers themselves may have a more or less common receptacle, but the essential floral organs are usually so distinct that they would be counted as belonging to two flowers. The details of the abnormalities do not concern us here, and will be discussed in due time. The essential question which we wish to answer on the

basis of data already tabled may be stated: Is an individual flower more (or less) likely to be abnormal if it is borne on a large* inflorescence than if it is produced on a small one?

If the chances of an individual flower being abnormal were in no way influenced by the number of flowers per inflorescence, but the chances of belonging to a synanthy were equal for all flowers, abnormalities would be distributed among the inflorescences in proportion to their number of flowers, and a correlation between the number of flowers and the number of abnormal flowers would result. Therefore this correlation coefficient will not give us the information we desire. What we need to know is the correlation between the number of flowers per inflorescence and the deviation of the number of abnormal flowers from the probable number if abnormalities were distributed among the inflorescences in proportion to the number of flowers they produce.

TABLE IV.

Spiraea Van Houtii.

Number of Flowers per Inflorescence.

Abnormal Flowers.	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Totals
0	1	—	5	5	8	6	9	13	16	22	17	17	12	18	21	12	14	17	9	9	3	—	234
2	—	—	1	1	2	1	9	5	3	3	5	7	9	10	7	10	6	6	4	—	1	1	91
3	—	—	—	—	—	—	1	1	2	3	7	3	3	6	10	2	1	—	3	1	1	1	45
4	—	—	—	—	—	—	—	—	—	—	—	2	1	1	3	—	—	1	—	—	—	—	8
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
Totals	1	0	6	6	10	7	19	19	21	28	29	29	25	35	41	24	21	24	16	10	6	2	379

Table IV. shows the number of flowers per inflorescence and the number of flowers counted as abnormal in each inflorescence. Since the abnormality with which we are dealing is the fusion† of two flowers there can be no group of "one flower abnormal"; each abnormality was considered as two or more abnormal flowers. Our series of data is not large but it has the advantage of being taken all from one clump of plants, probably all arising from the same individual, at the Missouri Botanical Garden.

The correlations are:

x = All flowers, y = Abnormal flowers,

$r_{xy} = \cdot 121 \pm \cdot 034$. $r_{xx} = -\cdot 071 \pm \cdot 034$.

With probable errors so large as these any trustworthy conclusion is impossible. But the negative sign of the r_{xx} coefficient will be sufficient to warn one against concluding that the larger (and so presumably the more vigorous, or "better nourished") inflorescences are more apt to produce abnormal flowers. They produce *actually* more, but this is only to be expected; the question is whether they produce *relatively* more.

Finally, I would again warn the reader against any generalization from the above illustrations. They are selected to show the kind of problems to which the biometric method described may be profitably applied.

* Here the only measure of the size of the inflorescence is the number of flowers which it produces.

† I wish to express no opinion whatever on the embryological origin of the anomaly, and the term fusion is used simply because it is the conventional and convenient term for such cases as these.

NOTICES AND BIBLIOGRAPHY.

NOTICES.

The Force of Adverse Selection among Entrants at the Extremes of Life (ages 15 to 25 and 60 or over), by EUGENE L. FISK, M.D.

A paper read before the Life Insurance Medical Directors' Association of America in which Dr Fisk re-examines, with the help of additional information, some conclusions expressed by Mr T. B. Macaulay in 1893, and comes to the conclusion that there is little adverse selection under 25, but that the group over 60 is "hypersensitive." It seems to us that this last conclusion is a natural consequence of an increasing value of the rate of mortality combined with paucity of data, and we also do not feel satisfied that Dr Fisk has done well in choosing the O^{W} (or with-profit policies) in preference to the O^{WN} (or without-profit policies) for his investigation as regards English experience. W. P. E.

Principles of Breeding, by E. DAVENPORT, M.Agr., LL.D. Boston, Ginn & Co. Pp. 727 + xiii.

This book is intended for the student of agriculture, and the practical breeder. Part I. deals with Variation, and discusses Morphological, Substantive, Meristic and Functional Variation; the treatment follows Bateson's "Materials," and many of Mr Davenport's illustrations are taken from that work. Part I. concludes with twenty pages on Mutation. Part II. deals with Causes of Variation, and interesting sections are devoted to Telegony, Genetic Selection, and the effect of light, food, &c., on living things. Part III. (Transmission) will probably be of most interest to readers of *Biometrika*, as it contains accounts of the methods employed in biometric research and Mendel's Law. Part IV. deals with Selection and practical problems in breeding. The book as a whole is written clearly and interestingly, and is well worth reading. W. P. E.

Die Pendulations-theorie, by Dr HEINRICH SIMROTH. Leipzig. Konrad Grethlein's Verlag, 1907. Pp. 564 + xii. Price M. 12.

A book on the geographical distribution of living things: it is entirely devoted to Reibisch's theory on the subject, and is only indirectly of interest to biometricians.

Mental and Moral Heredity in Royalty. A Statistical Study in History and Psychology, by FREDERICK ADAMS WOODS. New York (Holt), 1906. Pp. viii + 312. 104 portraits.

In spite of its somewhat tardy notice in these pages this is a book of some interest to biometricians. The work is a painstaking attempt to apply to certain material of history modern biometrical methods, with the view of reaching an adequate scientific basis for the analysis and interpretation of such material. It is suggestive of the possible usefulness of modern statistical methods in the field of history. The author's general plan in the investigation was as follows: Having as his general problem the determination of the intensity of inheritance of intellectual ability and of moral character, he proceeded to form the "ancestral tree" of twenty-two of the royal families of Europe, using Lehr's and von Behr's genealogies as primary sources. In these family trees there were 832 individuals, not counting repetitions. Each of these characters was graded (on a scale of 10 points) in respect to (*a*) intellectual ability, and (*b*) moral character. The basis of the grading was an objective treatment of statements regarding these persons found in standard historical and biographical reference works. A great deal of care was taken to make the grading accurate, and Dr Woods' decisions are probably as near to the truth as it is now possible to get. The major portion of the book is given to a summarized statement of the detailed evidence on which the grading and the dependent conclusions are based. The last two chapters are given over to the analytical treatment of the graded statistical material, and to the discussion of the conclusions to which this biometrical analysis leads. As the point of perhaps greatest interest to readers of *Biometrika*, it may be mentioned that Dr Woods holds that (*a*) there is definite evidence of the inheritance of intellectual ability and of moral character in royal families, and (*b*) that he considers the coefficients of correlation measuring this inheritance are in close accord with the expectation based on the law of ancestral inheritance.

R. P.

BIBLIOGRAPHY.

(1) ANDERSON, K. (Study of Prevalence of Cancer at Different Ages in Relation to its Etiology.) Norsk Magazin for Laegevidenskaben, Vol. LXVIII, No. 6. June, 1907.
Studies from various points of view the records of 12,179 cases of cancer reported in the collective inquiry in Germany, October 15, 1900.

(2) BEDDOE, J. The Estimation of Skull Capacity by a Peripheral Method. Zeitschr. f. Ethnol., Jahrg. 39, H. 4/5, pp. 695—701. 1908.
The author continues to assert that his empirical formulae are suitable for a problem which admits of really scientific treatment.

(3) BERG, W. Die Veränderungen des Volumens und Gewichtes des Gewebes bei der histologischen Fixation, dem Auswässern, der Härtung und der Paraffineinbettung. Vorl. Mitth. Anat. Anz., Bd. XXXI, pp. 252—268. 1907.
A thorough study from the quantitative standpoint of an important matter.

(4) BIRKNER, F. Die Dicke der Gesichtsweichteile bei verschiedenem Alter, Geschlecht und Rasse. Sitzungsber. d. Gesellsch. f. Morph. u. Physiol. München. Bd. XXIII, pp. 140—146. 1908.

(5) BROŽEK, A. Ueber die Variabilität und Localformen bei *Palaemonetes varians* Leach aus vier verschiedenen Localitäten. Sitzungsber. kgl. böhm. Ges. Wiss. II Classe. Prag, 1907. Pp. 1—27.
Local race constants.

(6) BRUYKER, C. DE. Een nieuw geval van omkeering eener "Halve Galton-Curve." Handl. Vlaamsch. natk.- en geneesk. Congres, Vol. XI, pp. 74—82. 1907

(7) CHODAT, R. Sur la fréquence des formes hétérostylées dans le *Primula officinalis*. Arch. des Sc. phys. et nat. Genève, T. XIX, pp. 309, 310. 1905.
Presents figures showing relative frequence of different heterostylic forms in nature; also a frequency distribution for the number of flowers to the inflorescence.

(8) CHODAT, R. et MONNIER, A. Sur la courbe de croissance des végétaux. Bull. herb. Boissier. 2e Sér. T. v, pp. 615, 616. 1905.

(9) DAVENPORT, C. B. Heredity and Mendel's Law. Proc. Washington Acad. Sci., Vol. IX, pp. 179—188.

(10) ——. Inheritance in Canaries. Carnegie Inst. of Washington, Publication, No. 95. 1908.
The phenomena of plumage inheritance in canaries are held by the author to be generally in accord with Mendelian principles.

(11) DAVENPORT, G. C. and DAVENPORT, C. B. Heredity of Eye Colour in Man. Science, N. S., Vol. XXVI, pp. 589—592. 1907.
Discussion from Mendelian stand-point of the statistics of eye colour in 132 individuals, with their ancestry. "Blue is recessive to gray and gray is recessive to brown."

(12) —— ——. Heredity of Hair-Form in Man. Amer. Nat., Vol. XLII, pp. 341—349. 1908.
Same material as is used in above-mentioned eye colour study. "All results indicate with a high degree of probability that straight hair is recessive to spiral hair." In some cases spiral may fail to dominate.

(13) EAST, E. M. A Study of the Factors influencing the Improvement of the Potato. Illinois Agr. Expt. Stat., Bulletin No. 127, pp. 375—456. 1908.
Contains rich material on variation and inheritance in the potato.

(14) DONALDSON, H. H. The Nervous System of the American Leopard Frog, *Rana pipiens*, compared with that of the European Frogs, *Rana esculenta* and *Rana temporaria* (*fusca*). Jour. Comp. Neurol. and Psychol., Vol. XVIII, pp. 121—149. 1908.
Discussion of biometric data.

(15) EDWARDS, C. L. Biometry as a Method in Taxonomy. Amer. Nat., Vol. XLII, pp. 537—540. 1908.
General discussion.

(16) ENRIQUES, P. La forma come funzione della grandezza. 2a memoria: Richerche sui gangli nervosi degli Invertebrati. Arch. f. Entwicklungsmech., Bd XXV., pp. 655—714. 1908.
A study of the general problem of the relation between cell size and body size.

(17) ——. Die Conjugation und sexuelle Differenzierung der Infusorien. Arch. f. Protistenkunde, Bd. XII, pp. 213—276. 1908.
Includes a biometrical study of conjugation in *Chilodon*. The author states that there is no homogamy, but the methods used to determine this are entirely inadequate. No correlation coefficients were calculated.

(18) FALCK, R. Wachstumsgesetze, Wachstumfaktoren und Temperaturwerte der holzzerstörenden Mycelien. Hausschwammforschungen, Jena, 1907. Pp. 53—154.
Growth curves.

(19) FICK, R. Vererbungsfragen, Reduktions- und Chromosomen-Hypothesen. Bastard-Regeln. Ergebnisse d. Anatomie u. Entwicklungsges., Bd. XVI. 1906. 140 pp.
General review of literature on the subject.

(20) Forbes, S. A. On the Life-History, Habits and Economic Relations of the White-Grubs and May-Beetles. Illinois Agr. Expt. Stat. Bullet., No. 116, pp. 447—480. 1907.
Presents extensive statistical data regarding habits and ecology.

(21) Fulton, T. Wemyss. Rate of Growth of Sea Fishes. Fishery Board for Scotland. 20th Ann. Rept., pp. 326—439, Pls. xiv—xxi. 1901.

(22) ——. The Rate of Growth of Fishes. *Ibid.*, 22nd Ann. Rept., pp. 141—241, Pls. vi—xii. 1904.

(23) ——. On the Growth and Age of the Herring (*Clupea harengus*). *Ibid.*, 24th Ann. Rept., pp. 293—342, Pls. xvii—xix. 1906.
These three papers give extensive statistics on the size (principally length) of various fish, falling in different age and locality groups. Usually the sexes are treated separately. The material is in the main unreduced. It seems likely that with proper biometrical reduction much of value might be made out of it from the standpoint of general problems of variation.

(24) Galton, F. Local Associations for Promoting Eugenics. Nature, Vol. lxxviii, pp. 645—647. 1908.

(25) Garbowski, L. Ueber Abschwächung und Variabilität bei *Bacillus luteus* Smith u. Baker und *Bacillus tumescens* Zopf. Inaug. Diss. Marburg, pp. 58. 1907.
Quantitative data on variation in bacteria when grown under different cultural conditions.

(26) Glaser, O. C. Statistical Study of Mitosis and Amitosis in the Entoderm of *Fasciolaria tulipa*, var. *distans*. Biol. Bulletin, Vol. xiv. 1908.

(27) Gray, J. A New Instrument for determining the Colour of the Hair, Eyes and Skin. Man, Vol. viii, pp. 54—58. 1908.

(28) Greene, D. W. The Association of Age and Incipient Cataract with Normal and Pathologic Blood Pressure. Jour. Amer. Med. Assoc., Vol. li, pp. 400—405. 1908.
Based on 600 examinations. 555 blood-pressure records given in the form of frequency distributions. All data from men over 60 years of age.

(29) Guilfoy, W. H. Death Rate of the City of New York as affected by the Cosmopolitan Character of its Population. Med. Record. Jan. 25, 1908.
A discussion of the death rates from all causes and from various single diseases in the city of New York as a whole, and in various blocks or sections each mainly inhabited by people of one nationality.

(30) Harper, P. Notes on the Weight and Convolutional Pattern in Seven Chinese Brains. Arch. Neurol. Path. Lab. London County Asyl., Vol. iii, pp. 201—207. 1907.

(31) Harper, R. A. The Organization of certain Coenobic Plants. Bull. of the Univ. of Wisconsin, No. 207, Science Series, Vol. iii, No. 7, pp. 279—334. 1908.
While not primarily a statistical paper the stand-point throughout is essentially biometrical. Deals with variation and regulation in the cell.

(32) Hatai, S. Studies on the Variation and Correlation of Skull Measurements in both Sexes of Mature Albino Rats (*Mus norvegicus*, var. *albus*). Amer. Jour. Anat., Vol. vii, pp. 423—441. 1907.
A thorough piece of biometric work.

(33) ——. A study of the Diameters of the Cells and Nuclei in the Second Cervical Spinal Ganglion of the Adult Albino Rat. Jour. Comp. Neurol. and Psychol., Vol. xvii, pp. 469—491. 1907.
A biometrical study, having for its object to determine whether there is intergradation between the usually distinguished types of ganglion cells. Finds a correlation of $0{\cdot}8616 \pm {\cdot}0055$ between nucleus and cell body.

(34) Heiberg, K. A. Ueber eine erhöhte Grösse der Zelle und deren Teile bei dem ausgewachsenen Organismus, verglichen mit dem noch nicht ausgewachsen. Anat. Anz., Bd. xxxi, pp. 306—311. 1907.

(35) Herzog, M. The Brain Weight of the Filipino. Amer. Anthrop., N. S., Vol. x. pp. 41—47. 1908.

(36) Heyer, A. Recherches de statistique sur la variabilité des feuilles végétatives de *Prunus spinosa* L. Arch. Sc. phys. et nat. Genève, T. xxii, pp. 367—368. 1906.

(37) Holst, P. F., Nicolaysen, L., und Ustvedt, Y. Untersuchungen über die Lebensdauer der Schwindsüchtigen in Norwegen. Deutsch. Archiv für klin. Med., Bd. lxxxviii, pp. 325—350. 1907.
Discusses the duration of the disease.

(38) Hurst, C. C. Mendel's Law of Heredity. Jour. Roy. Hort. Soc., Vol. xxxii, pp. 227—229. 1907.
Brief general account.

(39) Johannessen, A. De forskjellige Dødsaarsagers Indflydelse paa Spaedbarndødeligheden i Norge. Vidensk.-Selks. Skrift. i Math.-Naturv. Klasse, 1907, No. 9, pp. 1—27. 1908.

(40) ——. Untersuchungen über den Einfluss der verschiedenen Todesursachen auf die gesamte Säuglingssterblichkeit Norwegens. Jahrb. f. Kinderheilk., N. F., Bd. lxvii, pp. 513—550. 1908.
A German resumé of the above-cited paper.

(41) Johnson, R. H. The Individuality and Variation of the Pyloric Caeca of the Centrarchidae. Trans. Wisc. Acad. Sci., Vol. xv, pp. 713—732. 1907.
Frequency distributions; no constants calculated.

(42) Jones, C. P. A Study of One Hundred Refraction Cases in Indians Fresh from the Plains. Jour. Amer. Med. Assoc., Vol. li, pp. 308—312. 1908.
Statistical data regarding vision based on 289 admissions to Hampton Institute.

(43) Jones, F. W. The Examination of the Bodies of 100 Men executed in Nubia in Roman Times. British Med. Jour., pp. 736—739. 1908.

(44) Joseph, D. R. The Ratio between the Heart-weight and Body-weight in various Animals. Jour. Exper. Med., Vol. x, pp. 521—528. 1908.
A discussion of the conclusions reached from the weighing of a comparatively small number of individuals. The author apparently does not know of Greenwood's work on the subject, and fails entirely to grasp the significance and importance of regression in problems like that which he is studying.

(45) Kapteyn, J. C. Reply to Prof. Pearson's Criticisms. Recueil des Trav. Botan. Néerlandais, Vol. ii, pp. 216—222. 1906.

(46) Kiesel, K. Ueber die Vererbung von Farben und Abzeichen beim Pferd. Arch. f. wiss. u. prakt. Tierheilk., Bd. xxxiv, pp. 185—217. 1908.

(47) Koriba, K. Variation in the ray-flowers of some Compositae. Botan. Mag. Tokyo, Vol. xxii, pp. 86—90. 1908.

(48) Laitinen, T. Ueber die Einwirkung der kleinsten Alkoholmengen auf die Widerstandsfähigkeit des tierischen Organismus mit besonderer Berücksichtigung der Nachkommenschaft. Zeitschr. f. Hygiene, Bd. lviii, pp. 139—164. 1907.
Gives data obtained from breeding experiments, which the author believes show an inherited effect following the administration of alcohol to rabbits and guinea-pigs.

(49) Lapicque, L. Comparaison du poids encéphalique entre les deux sexes de l'espèce humaine. Compt. rend. Soc. biol., T. lxiii, No. 32, 432—435. 1907.

(50) LAPICQUE, L. Tableau général des poids somatique et encéphalique dans les espèces animales. Bull. et mém. Soc. d'Anthropol. de Paris, 5 Ser., T. VIII, pp. 248—270. 1907.

(51) ——. Le poids encéphalique en fonction du poids corporel entre individus d'une même espèce. *Ibid.*, T. VIII, pp. 313—345. 1907.

(52) LUTZ, F. E. The Variation and Correlation of Certain Taxonomic Characters of Gryllus. A dissertation for the degree of Doctor of Philosophy, Ogden Graduate School of Science, University of Chicago. Chicago, 1908. Pp. 63.

"'Species' within this genus is a question of fluctuating variability, and only in one organ, conspicuous but relatively unimportant, do we find a clear case of mutation."

(53) ——. The Inheritance of the Manner of Clasping the Hands. Amer. Nat., Vol. XLII, pp. 195, 196. 1908.

Data from about 600 families indicating that there is a distinct inheritance of the tendency always to clasp the hands with either the right or the left thumb uppermost. The inheritance is not Mendelian. There is no assortative mating with regard to this character.

(54) LYNCH, F. W. Hour of Birth. A Discussion of the Hour at which Birth most often Occurs. Surgery, Gynaecology and Obstetrics, Chicago, December, 1907.

An analysis of the hour of birth in 1508 full term spontaneous labours at the Johns Hopkins Hospital. Births pretty evenly distributed over the 24 hours; only 4 per cent. more between the hours of 7 p.m. and 7 a.m. than in the other 12 hours.

(55) MACDOUGAL, D. T., VAIL, A. M., and SHULL, G. H. Mutations, Variations and Relationships of the Oenotheras. Carnegie Instit. of Washington, Publ. 81. 1907.

A continuation of previous work. The biometrical portion is contributed by Shull.

(56) MACLEOD, J. and BURVENICH, J. V. Over den invloed der levensvoorwaarden op het aantal randbloemen bij Chrysanthemum carinatum en over de trappen der veranderlijkheid. Bot. Jaarb. Dodonea, Vol. XIII, pp. 70—170. 1907.

(57) MANTON, W. H. The Relation of the Weight of the Placenta to the Weight of the Newborn Child. Buffalo Med. Jour., May 1908.

Weight of child : weight of placenta :: 6 : 1. Based on 400 normal cases taken from hospital records.

(58) MCCRACKEN, I. Occurrence of a Sport in Melasoma (*Lina*) scripta and its Behaviour in Heredity. Jour. Exper. Zool., Vol. IV, pp. 221—238.

(59) PEARL, M. D. and PEARL, R. On the Relation of Race Crossing to the Sex Ratio. Biol. Bulletin, Vol. XV, pp. 194—205. 1908.

Shows that in Buenos Ayres statistics there is a preponderance of males in the offspring of racially crossed as compared with racially pure matings.

(60) PEARL, R. and SURFACE, F. M. Appliances and Methods for Pedigree Poultry Breeding. Maine Agr. Expt. Stat., Bulletin No. 159, pp. 239—274. 1908.

Describes *inter alia* a method of keeping pedigree records adapted to breeding operations on a large scale.

(61) POPPER, J. Ueber den Zusammenhang zwischen Genie und Körpergrösse. Polit.-anthrop. Rev., Bd. VI, pp. 485—492. 1907.

(62) PRINZING. Beziehungen zwischen sozialer Lage und Sterblichkeit an Krebs und Schwindsucht. Zeitschr. f. soziale Med., Bd. II, Heft 4.

(63) PROUT, L. B. *Xanthorrhoë ferrugata* (Clerck) and the Mendelian hypothesis. Trans. Entom. Soc. London, 1906, pp. 525—531. 1907.

(64) PUNNETT, R. C. Mendelism in Relation to Disease. Proc. Roy. Soc. of Med., March, 1908, pp. 1—27.

(65) REITSMA, J. F. Correlatieve Variabiliteit bij Planten. Inaug. Diss. Amsterdam, pp. 98. 1907.

(66) RITTER, G. Beiträge zur Physiologie des Flächenwachstums der Pflanzen. Beihefte z. Botan. Centrlbl., Bd. XXII, 2 Abth., Heft 3, pp. 317—329. 1907.
Contributes new statistical data on leaf size.

(67) RITTER, W. F. and BAILEY, S. E. On the Weight of developing Eggs. Univ. of California Publ. Zoology, Vol. VI, pp. 1—10.
The eggs of *Fundulus parvipinnis* were found to diminish steadily in weight during early development.

(68) ROHRER, F. Eine neue Formel zur Bestimmung der Körperfülle. Korresp.-Bl. d. Deutsch. Ges. f. Anthr., Bd. XXXIX, pp. 5—7. 1908.

(69) RUTHVEN, A. G. Variations and Genetic Relationships of the Garter-Snakes. U. S. National Museum, Bulletin No. 61, pp. xii+201. 1908.
An extensive and detailed study of geographical variation.

(70) SAKURAI. Der Unterschied in der Geburtsdauer der japanischen und europäischen Frauen. Alte u. neue Gynaekol...Franz Ritter v. Winckel..., München, pp. 151—154. 1907.

(71) SCHEEL, C. (Measurement of Blood Vessels and Ateriosclerosis.) Norsk Magazin for Laegevidenskaben, Vol. LXVIII, No. 6. June 1907.
Has measured the diameter and length of the aorta and pulmonary arteries in 500 cadavers. Finds increase in diameter and in length with increasing age.

(72) SCHOUTEN, A. R. Mutabiliteit en Variabiliteit. Diss. Amsterdam, pp. xii+193. 1908.

(73) SHULL, G. H. A New Mendelian Ratio and Several Types of Latency. Amer. Nat., Vol. XLII, pp. 433—451. 1908.
Discussion of bean hybrids. The new ratio is 18 : 18 : 6 : 6 : 16.

(74) SMITH, L. H. Ten Generations of Corn Breeding. Illinois Agr. Expt. Stat., Bulletin No. 128, pp. 457—575. 1908.
Gives the detailed records of ten years of pedigree-breeding of corn. A remarkable demonstration of the effect of selection of 'fluctuating' variations.

(75) STEPHANIE. Prophylaxe des Wachsthums und Methode der Körpermessung. 2 fig. Charlottenburg, 1907. 19 pp.
Reprinted from *Das Schulzimmer*.

(76) STEVENS, N. M. Colour Inheritance and Sex Inheritance in Certain Aphids. Science, N. S., Vol. XXVI, pp. 216—218. 1907.

(77) TROPEA, C. La variazione della *Bellis perennis* L. in rapporto alle sue condizioni d' esistenza. Malpighia, Vol. XXI, pp. 276—283. 1908.
A study of seasonal variation. 10954 heads examined.

(78) TUTTLE, L. The Relation between the Weight and Age in the Fetus. Jour. Amer. Med. Assoc., Vol. LI, pp. 919, 920. 1908.
$W = 100\,(m-2)^2/2$, where $W =$ weight of fetus in grams, and $m =$ age in months.

(79) URBAN, F. M. On the Method of just Perceptible Differences. Psychol. Rev., Vol. XIV, pp. 244—253. 1907.
A brief summary of certain portions of the memoir listed next below.

(80) URBAN, F. M. The Application of Statistica' Methods to the Problems of Psychophysics. Exper. Stud. in Psychol. and Pedagogy, III. Philadelphia, 1908. Pp. ix + 221.

Gives the detailed results of extensive experiments to determine the "threshold of difference" in the estimation of small weights. A considerable portion of the memoir is devoted to a general discussion of statistical theory, with particular reference to psychophysical data.

(81) VARIOT, G. et LASSABLIÈRE, P. Sur l'inégalité de volume des glandes mammaires chez la femme. Conséquences physiologiques. C. R. Acad. Sci. Paris, T. CXLVII, pp. 270—272. 1908.

Discussion based on 550 subjects.

(82) YUNG, E. Des variations de la longueur de l'intestin chez la grenouille. C. R. Acad. Sci. Paris, T. CXLV, No. 25, pp. 1306—1309. 1907.

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PIGMENTATION SURVEY OF SCHOOL CHILDREN IN SCOTLAND.

By J. F. TOCHER.

This Appendix to the Report giving the absolute numbers for all the divisions, counties and districts of Scotland is issued as a Supplement to Biometrika, Vol. VI.

The cost of printing has been defrayed from a special fund presented to this Journal in memory of W. F. R. WELDON.

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APPENDIX.

TABLE I.

Grand Summary. Boys and Girls. Divisions.

Division	Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
1	4062	781	5552	3610	238	2508	4030	4496	3209	14243
2	5214	949	6891	5139	401	3656	5592	5460	3886	18594
3	19453	4219	29396	17479	800	11039	21331	23483	15492	71345
4	20092	3822	31672	18701	954	11470	21794	24397	17580	75241
5	10429	1947	16417	10692	581	5788	12909	12695	8674	40066
6	47607	10083	83969	49732	2285	26365	58941	63868	44502	193676
7	17088	3425	26823	14735	622	9278	19303	20070	14042	62693
8	7403	1371	10722	6498	303	4031	8308	8222	5736	26297
Totals	131348	26597	211442	126584	6184	74135	152208	162691	113121	502155

TABLE II.

Percentages. Boys and Girls. Divisions.

Division	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark
1	28·52	5·48	38·98	25·35	1·67	17·61	28·29	31·57	22·53
2	28·04	5·10	37·06	27·64	2·16	19·66	30·08	29·36	20·90
3	27·27	5·91	41·20	24·50	1·12	15·47	29·90	32·91	21·72
4	26·70	5·08	42·09	24·86	1·27	15·24	28·97	32·43	23·36
5	26·03	4·86	40·97	26·69	1·45	14·45	32·22	31·68	21·65
6	24·58	5·21	43·36	25·68	1·17	13·61	30·43	32·98	22·98
7	27·26	5·46	42·79	23·50	·99	14·80	30·79	32·01	22·40
8	28·15	5·22	40·77	24·71	1·15	15·33	31·59	31·27	21·81

TABLE III.

Grand Summary. Divisions.

BOYS

Division	Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
I	1963	452	2994	1994	133	1304	2100	2467	1665	7536
II	2568	513	3666	2630	190	1841	2902	2875	1949	9567
III	9278	2251	15586	9015	403	5587	10946	12132	7868	36533
IV	9762	2003	16911	9551	506	5956	11255	12631	8891	38733
V	5128	1043	8635	5577	306	2971	6618	6657	4443	20689
VI	23891	5361	43944	24979	1216	13314	30348	33075	22654	99391
VII	8179	1803	14054	7374	322	4724	9737	10169	7102	31732
VIII	3543	736	5779	3391	136	2091	4234	4328	2932	13585
Totals	64312	14162	111569	64511	3212	37788	78140	84334	57504	257766

GIRLS

Division	Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
I	2099	329	2558	1616	105	1204	1930	2029	1544	6707
II	2646	436	3225	2509	211	1815	2690	2585	1937	9027
III	10175	1968	13810	8462	397	5452	10385	11351	7624	34812
IV	10330	1819	14761	9150	448	5514	10539	11766	8689	36508
V	5301	904	7782	5115	275	2817	6291	6038	4231	19377
VI	23716	4722	40025	24753	1069	13051	28593	30793	21848	94285
VII	8909	1622	12769	7361	300	4554	9566	9901	6940	30961
VIII	3860	635	4943	3107	167	1940	4074	3894	2804	12712
Totals	67036	12435	99873	62073	2972	36347	74068	78357	55617	244389

TABLE IV.

Percentages of the Classes for each of the Divisions.

BOYS

Division	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark
1	26·05	6·00	39·73	26·46	1·76	17·30	27·87	32·74	22·09
2	26·84	5·36	38·32	27·49	1·99	19·24	30·34	30·05	20·37
3	25·40	6·16	42·66	24·68	1·10	15·29	29·96	33·21	21·54
4	25·20	5·17	43·66	24·66	1·31	15·38	29·06	32·61	22·95
5	24·78	5·04	41·74	26·96	1·48	14·36	31·99	32·18	21·47
6	24·04	5·40	44·21	25·13	1·22	13·40	30·53	33·28	22·79
7	25·77	5·68	44·29	23·24	1·02	14·89	30·68	32·05	22·38
8	26·08	5·42	42·54	24·96	1·00	15·39	31·17	31·86	21·58
General Population	24·95	5·49	43·28	25·03	1·25	14·66	30·31	32·72	22·31

GIRLS

Division	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark
1	31·30	4·90	38·14	24·09	1·57	17·95	28·78	30·25	23·02
2	29·31	4·83	35·73	27·79	2·34	20·10	29·80	28·64	21·46
3	29·23	5·65	39·67	24·31	1·14	15·66	29·83	32·61	21·90
4	28·30	4·98	40·43	25·06	1·23	15·10	28·87	32·23	23·80
5	27·36	4·67	40·16	26·39	1·42	14·54	32·47	31·16	21·83
6	25·16	5·01	42·45	26·25	1·13	13·84	30·33	32·66	23·17
7	28·77	5·24	41·24	23·78	·97	14·71	30·90	31·98	22·41
8	30·37	5·00	38·88	24·44	1·31	15·26	32·05	30·63	22·06
General Population	27·43	5·09	40·87	25·40	1·22	14·87	30·31	32·06	22·76

TABLE V.

Grand Summary. Counties.

BOYS

County	No.	Hair					Eyes				Totals
		Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Aberdeen ...	*1*	6426	1600	11189	6382	283	3844	7848	8682	5506	25880
Argyll ...	*2*	1202	257	1866	1513	77	709	1658	1573	975	4915
Ayr ...	*3*	4476	893	6977	4116	203	2748	5238	5125	3554	16665
Banff ...	*4*	1250	325	2047	1147	55	734	1335	1626	1129	4824
Berwick ...	*5*	462	72	554	362	22	238	500	435	299	1472
Bute ...	*6*	233	71	567	312	25	124	407	412	265	1208
Caithness ...	*7*	711	169	1141	744	68	361	805	976	691	2833
Clackmannan ...	*8*	493	87	844	469	6	245	627	639	388	1899
Dumbarton ...	*9*	1408	250	2188	1338	77	739	1736	1615	1171	5261
Dumfries ...	*10*	1503	262	2502	1336	43	745	1826	1941	1134	5646
Edinburgh ...	*11*	5387	1169	9217	5025	186	3044	6416	6642	4882	20984
Elgin ...	*12*	819	160	1068	650	35	573	722	836	601	2732
Fife ...	*13*	3085	618	5340	2946	156	1768	3541	4112	2724	12145
Forfar ...	*14*	3887	878	7173	3966	194	2594	4493	5177	3834	16098
Haddington ...	*15*	497	123	912	466	31	380	589	641	419	2029
Inverness ...	*16*	1293	257	1889	1389	93	938	1474	1454	1055	4921
Kincardine ...	*17*	647	141	1050	739	26	360	870	822	551	2603
Kinross ...	*18*	125	26	268	118	5	66	168	197	111	542
Kirkcudbright ...	*19*	712	176	1263	865	30	484	956	923	683	3046
Lanark ...	*20*	16455	3788	31329	17736	837	8686	21428	23751	16280	70145
Linlithgow ...	*21*	1299	311	2278	1094	58	718	1625	1664	1033	5040
Nairn ...	*22*	136	25	232	97	4	76	171	166	81	494
Orkney ...	*23*	565	101	819	496	27	353	615	691	349	2008
Peebles ...	*24*	214	60	502	198	11	121	330	326	208	985
Perth ...	*25*	2172	394	3286	2052	145	1283	2426	2506	1834	8049
Renfrew ...	*26*	2960	680	5638	3127	176	1880	3682	4199	2820	12581
Ross & Cromarty	*27*	1275	256	1777	1241	97	903	1428	1421	894	4646
Roxburgh ...	*28*	794	168	1155	639	32	492	863	782	650	2788
Selkirk ...	*29*	320	68	591	229	14	223	277	461	261	1222
Shetland ...	*30*	371	91	540	346	21	354	329	382	304	1369
Stirling ...	*31*	2285	465	4014	2414	127	1399	2817	3057	2032	9305
Sutherland ...	*32*	316	91	494	408	17	236	351	418	321	1326
Wigtown ...	*33*	534	130	859	551	31	369	589	682	465	2105
Totals ...	—	64312	14162	111569	64511	3212	37788	78140	84334	57504	257766

TABLE VI.

Grand Summary. Counties.

GIRLS

County	No.	Hair					Eyes				Totals
		Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Aberdeen ...	*1*	6890	1322	9762	5972	271	3677	7293	7963	5284	24217
Argyll ...	*2*	1222	229	1676	1324	86	688	1504	1418	927	4537
Ayr ...	*3*	4687	795	6483	3837	171	2708	4911	4960	3394	15973
Banff ...	*4*	1499	336	1944	1103	46	761	1398	1622	1147	4928
Berwick ...	*5*	450	66	477	303	12	211	442	387	268	1308
Bute ...	*6*	306	64	465	330	15	140	397	401	242	1180
Caithness ...	*7*	744	117	996	647	50	357	775	798	624	2554
Clackmannan ...	*8*	485	67	706	394	4	195	561	555	345	1656
Dumbarton ...	*9*	1422	214	1940	1326	69	679	1729	1470	1093	4971
Dumfries ...	*10*	1658	251	2085	1217	63	721	1702	1750	1101	5274
Edinburgh ...	*11*	5822	1084	8656	5033	212	2957	6398	6687	4765	20807
Elgin ...	*12*	836	134	991	634	41	505	691	841	599	2636
Fife ...	*13*	3518	547	4575	2850	98	1709	3317	3813	2749	11588
Forfar ...	*14*	3922	785	6313	3840	211	2315	4188	4834	3734	15071
Haddington ...	*15*	625	108	770	496	18	353	637	595	432	2017
Inverness ...	*16*	1283	215	1630	1330	119	936	1387	1216	1038	4577
Kincardine ...	*17*	797	146	929	640	36	413	866	752	517	2548
Kinross ...	*18*	159	26	223	113	5	65	172	179	110	526
Kirkcudbright ...	*19*	783	131	1063	722	36	390	940	815	590	2735
Lanark ...	*20*	16165	3353	28447	17729	729	8685	20150	21888	15700	66423
Linlithgow ...	*21*	1459	252	1916	1103	38	721	1498	1510	1039	4768
Nairn ...	*22*	153	30	184	113	3	96	137	173	77	483
Orkney ...	*23*	573	87	672	405	21	321	536	577	324	1758
Peebles ...	*24*	244	49	466	217	8	120	315	338	211	984
Perth ...	*25*	2246	394	2944	1953	130	1230	2301	2385	1751	7667
Renfrew ...	*26*	2864	574	5095	3187	169	1658	3532	3945	2754	11889
Ross & Cromarty	*27*	1363	221	1595	1179	92	879	1303	1369	899	4450
Roxburgh ...	*28*	800	147	984	587	35	423	790	723	617	2553
Selkirk ...	*29*	309	63	484	209	12	192	276	384	225	1077
Shetland ...	*30*	378	64	408	261	18	284	272	310	263	1129
Stirling ...	*31*	2351	397	3701	2135	105	1310	2661	2749	1969	8689
Sutherland ...	*32*	404	61	482	303	16	242	347	344	333	1266
Wigtown ...	*33*	619	106	811	581	33	406	642	606	496	2150
Totals ...	—	67036	12435	99873	62073	2972	36347	74068	78357	55617	244389

TABLE VII.

Colour Percentages. Counties.

BOYS

County	No.	Hair					Eyes			
		Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
Aberdeen ...	*1*	24·83	6·18	43·24	24·66	1·10	14·85	30·32	33·55	21·28
Argyll ...	*2*	24·46	5·23	37·96	30·78	1·57	14·43	33·73	32·00	19·84
Ayr ...	*3*	26·86	5·36	41·86	24·70	1·22	16·49	31·43	30·75	21·33
Banff ...	*4*	25·91	6·74	42·43	23·78	1·14	15·22	27·67	33·71	23·40
Berwick ...	*5*	31·39	4·89	37·64	24·59	1·49	16·17	33·97	29·55	20·31
Bute ...	*6*	19·29	5·88	46·94	25·82	2·07	10·27	33·69	34·10	21·94
Caithness ...	*7*	25·10	5·97	40·27	26·26	2·40	12·74	28·42	34·45	24·39
Clackmannan ...	*8*	25·96	4·58	44·44	24·70	·32	12·90	33·02	33·65	20·43
Dumbarton ...	*9*	26·76	4·75	41·59	25·43	1·47	14·05	33·00	30·70	22·25
Dumfries ...	*10*	26·62	4·64	44·32	23·66	·76	13·20	32·34	34·38	20·08
Edinburgh ...	*11*	25·68	5·57	43·92	23·95	·88	14·51	30·58	31·65	23·26
Elgin ...	*12*	29·98	5·86	39·09	23·79	1·28	20·97	26·43	30·60	22·00
Fife ...	*13*	25·40	5·09	43·97	24·26	1·28	14·56	29·15	33·86	22·43
Forfar ...	*14*	24·15	5·45	44·56	24·64	1·20	16·11	27·91	32·16	23·82
Haddington ...	*15*	24·49	6·06	44·95	22·97	1·53	18·73	29·03	31·59	20·65
Inverness ...	*16*	26·27	5·22	38·39	28·23	1·89	19·06	29·95	29·55	21·44
Kincardine ...	*17*	24·85	5·41	40·33	28·39	1·00	13·83	33·42	31·58	21·17
Kinross ...	*18*	23·06	4·80	49·45	21·77	·92	12·18	30·99	36·35	20·48
Kirkcudbright ...	*19*	23·38	5·78	41·46	28·40	·98	15·89	31·39	30·30	22·42
Lanark ...	*20*	23·46	5·40	44·66	25·29	1·19	12·38	30·55	33·86	23·21
Linlithgow ...	*21*	25·77	6·17	45·20	21·71	1·15	14·25	32·24	33·01	20·50
Nairn ...	*22*	27·53	5·06	46·96	19·64	·81	15·39	34·61	33·60	16·40
Orkney ...	*23*	28·14	5·03	40·79	24·70	1·34	17·58	30·63	34·41	17·38
Peebles ...	*24*	21·73	6·09	50·96	20·10	1·12	12·28	33·50	33·10	21·12
Perth ...	*25*	26·99	4·89	40·83	25·49	1·80	15·94	30·14	31·13	22·79
Renfrew ...	*26*	23·53	5·41	44·81	24·85	1·40	14·94	29·27	33·38	22·41
Ross & Cromarty	*27*	27·44	5·51	38·25	26·71	2·09	19·44	30·73	30·59	19·24
Roxburgh ...	*28*	28·48	6·02	41·43	22·92	1·15	17·68	30·96	28·05	23·31
Selkirk ...	*29*	26·19	5·56	48·36	18·74	1·15	18·25	22·67	37·72	21·36
Shetland ...	*30*	27·10	6·65	39·45	25·27	1·53	25·86	24·03	27·90	22·21
Stirling ...	*31*	24·56	5·00	43·14	25·94	1·36	15·03	30·28	32·85	21·84
Sutherland ...	*32*	23·83	6·86	37·26	30·77	1·28	17·80	26·47	31·52	24·21
Wigtown ...	*33*	25·37	6·17	40·81	26·18	1·47	17·53	27·98	32·40	22·09
Total Population	—	24·95	5·49	43·28	25·03	1·25	14·66	30·31	32·72	22·31

TABLE VIII.

Colour Percentages. Counties.

GIRLS

County	No.	Hair					Eyes			
		Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
Aberdeen ...	*1*	28·41	5·46	40·31	24·66	1·12	15·18	30·12	32·88	21·82
Argyll ...	*2*	26·93	5·05	36·94	29·18	1·90	15·16	33·15	31·26	20·43
Ayr ...	*3*	29·34	4·98	40·59	24·02	1·07	16·95	30·75	31·05	21·25
Banff ...	*4*	30·42	6·82	39·45	22·38	·93	15·44	28·37	32·91	23·28
Berwick ...	*5*	34·40	5·05	36·47	23·16	·92	16·13	33·79	29·59	20·49
Bute ...	*6*	25·93	5·42	39·41	27·97	1·27	11·87	33·64	33·98	20·51
Caithness ...	*7*	29·13	4·58	39·00	25·33	1·96	13·98	30·35	31·24	24·43
Clackmannan ...	*8*	29·29	4·05	42·63	23·79	·24	11·78	33·88	33·51	20·83
Dumbarton ...	*9*	28·61	4·30	39·03	26·67	1·39	13·66	34·78	29·57	21·99
Dumfries ...	*10*	31·44	4·76	39·53	23·08	1·19	13·67	32·27	33·18	20·88
Edinburgh ...	*11*	27·98	5·21	41·60	24·19	1·02	14·21	30·75	32·14	22·90
Elgin ...	*12*	31·72	5·08	37·59	24·05	1·56	19·16	26·21	31·90	22·73
Fife ...	*13*	30·36	4·72	39·48	24·59	·85	14·75	28·62	32·91	23·72
Forfar ...	*14*	26·02	5·21	41·89	25·48	1·40	15·36	27·79	32·07	24·78
Haddington ...	*15*	30·99	5·35	38·18	24·59	·89	17·50	31·58	29·50	21·42
Inverness ...	*16*	28·03	4·70	35·61	29·06	2·60	20·45	30·30	26·57	22·68
Kincardine ...	*17*	31·28	5·73	36·46	25·12	1·41	16·21	33·99	29·51	20·29
Kinross ...	*18*	30·23	4·94	42·40	21·48	·95	12·36	32·70	34·03	20·91
Kirkcudbright ...	*19*	28·63	4·79	38·87	26·40	1·31	14·26	34·37	29·80	21·57
Lanark ...	*20*	24·33	5·05	42·83	26·69	1·10	13·07	30·34	32·95	23·64
Linlithgow ...	*21*	30·60	5·29	40·18	23·13	·80	15·12	31·42	31·67	21·79
Nairn ...	*22*	31·67	6·21	38·10	23·40	·62	19·88	28·36	35·82	15·94
Orkney ...	*23*	32·59	4·95	38·23	23·04	1·19	18·26	30·49	32·82	18·43
Peebles ...	*24*	24·80	4·98	47·36	22·05	·81	12·20	32·01	34·35	21·44
Perth ...	*25*	29·29	5·14	38·40	25·47	1·70	16·04	30·01	31·11	22·84
Renfrew ...	*26*	24·09	4·83	42·85	26·81	1·42	13·95	29·71	33·18	23·16
Ross & Cromarty	*27*	30·63	4·97	35·84	26·49	2·07	19·75	29·28	30·77	20·20
Roxburgh ...	*28*	31·34	5·76	38·54	22·99	1·37	16·57	30·94	28·32	24·17
Selkirk ...	*29*	28·69	5·85	44·94	19·41	1·11	17·83	25·63	35·65	20·89
Shetland ...	*30*	33·48	5·67	36·14	23·12	1·59	25·16	24·09	27·46	23·29
Stirling ...	*31*	27·06	4·57	42·59	24·57	1·21	15·08	30·62	31·64	22·66
Sutherland ...	*32*	31·91	4·82	38·07	23·94	1·26	19·12	27·41	27·17	26·30
Wigtown ...	*33*	28·79	4·93	37·72	27·02	1·54	18·88	29·86	28·19	23·07
Total Population	—	27·43	5·09	40·87	25·40	1·22	14·87	30·31	32·06	22·76

TABLE IX.

Colour Percentages. Chief Cities.

BOYS

	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
Aberdeen City ...	24·54	6·22	43·31	25·19	·74	12·79	30·92	33·44	22·85
„ County	25·06	6·15	43·17	25·23	1·39	16·56	29·83	33·63	19·98
Edinburgh City ...	26·31	5·39	42·98	24·32	1·00	15·11	29·81	30·47	24·61
Leith ...	23·57	5·92	45·42	24·36	·73	10·55	32·60	34·16	22·69
Edinburgh County	26·76	5·53	44·05	22·81	·85	17·66	29·79	31·11	21·44
Dundee ...	23·22	5·41	45·38	24·58	1·41	14·54	27·44	33·86	24·16
Forfar ...	25·22	5·50	43·61	24·70	·97	17·94	28·46	30·18	23·42
Glasgow ...	22·13	5·35	45·26	26·10	1·16	11·09	30·57	33·98	24·36
Govan ...	21·50	5·30	47·15	24·79	1·26	14·63	30·18	31·61	23·58
Lanark County ...	25·32	5·48	43·35	24·64	1·21	12·96	30·64	34·41	21·99

GIRLS

	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
Aberdeen City ...	27·29	5·58	40·82	25·62	·69	13·93	29·78	33·68	22·61
„ County	29·36	5·36	39·91	23·91	1·46	16·16	30·38	32·26	21·20
Edinburgh City ...	26·61	4·98	41·14	25·84	1·43	14·75	29·85	30·75	24·65
Leith ...	27·53	4·97	41·99	24·89	·62	11·04	32·88	34·53	21·55
Edinburgh County	31·01	5·91	42·03	20·34	·71	16·74	30·06	32·06	21·14
Dundee ...	24·57	5·06	42·56	26·37	1·44	14·04	27·18	34·32	24·46
Forfar ...	27·81	5·39	41·07	24·38	1·35	16·99	28·54	29·31	25·16
Glasgow ...	21·44	4·85	43·56	28·85	1·30	11·98	29·76	33·78	24·48
Govan ...	21·62	5·11	45·75	26·41	1·11	14·10	30·97	30·92	24·01
Lanark County ...	28·03	5·22	41·20	24·65	·90	13·84	30·71	32·76	22·69

TABLE X.

Values of Δ *or* $(y_s'' - y_s')/\sqrt{npq}$. *Counties.*

$$\Delta \Big/ \sqrt{1 - \left(\frac{n-1}{N-1}\right)} = (RLD) = \textit{Relative Local Difference.}$$

On comparing this table with Tables VIII. and IX. of memoir, it will be seen how far the values of Δ diverge from those of (RLD). In many cases they are fair approximations, but where n is moderately large the Δ's diverge widely from the real relative local difference or (RLD). The signs (not shown in this table) are the same as Tables VIII. and IX. of memoir.

TABLE X.

	BOYS									GIRLS								
	HAIR					EYES				HAIR					EYES			
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark
Aberdeen County	·32	3·45	·26	2·21	1·48	6·38	1·23	2·32	6·67	5·04	1·44	2·27	3·99	2·64	4·24	·17	·50	4·34
" City ...	1·01	3·47	·07	·39	5·00	5·73	1·44	1·67	1·42	·32	2·32	·11	·52	4·94	2·72	1·18	3·57	·37
Argyll ...	·80	·80	7·52	9·31	2·00	·47	5·22	1·07	4·16	·75	·13	5·38	5·86	4·23	·56	4·16	1·16	3·74
Ayr ...	5·69	·74	3·68	·99	·37	6·68	3·15	5·41	3·05	5·42	·65	·73	4·00	1·61	7·40	1·20	2·73	4·56
Banff ...	1·54	3·80	1·19	2·01	·69	1·09	3·98	1·46	1·82	4·70	5·52	2·03	4·87	1·77	1·13	2·97	1·28	·86
Berwick ...	5·71	1·01	4·37	·39	·85	1·64	3·05	2·59	1·84	5·65	·07	3·24	1·86	·97	1·28	2·74	1·92	1·96
Bute ...	4·55	·59	2·57	·64	2·57	4·32	2·56	1·03	·31	1·15	·52	1·02	2·03	·19	2·90	2·49	1·42	1·85
Caithness ...	·18	1·11	3·23	1·51	5·51	2·89	2·20	1·96	2·66	1·93	1·17	1·92	·08	3·45	1·27	·04	·88	2·02
Dumbarton ...	3·04	2·35	2·48	·67	1·39	1·26	4·24	3·13	·09	1·86	2·52	2·64	2·07	1·15	2·40	6·86	3·76	1·30
Dumfries ...	2·90	2·80	1·57	2·37	3·30	3·11	3·32	2·66	4·02	6·52	1·09	1·97	3·88	·10	2·45	3·10	1·75	3·26
Edinburgh County	3·06	·12	1·13	3·75	2·60	6·22	·83	2·51	1·54	5·82	2·70	1·71	8·43	3·34	3·80	·39	·01	2·80
" City ...	3·13	·45	·60	1·62	2·25	1·27	1·08	4·75	5·46	1·81	·50	·54	1·01	1·96	·34	·99	2·77	4·46
Leith ...	2·43	1·45	3·28	1·17	3·60	8·84	3·80	2·33	·69	·18	·43	1·74	·90	4·12	8·22	4·27	4·04	2·19
Elgin & Nairn ...	6·11	·61	3·42	2·46	·21	8·76	3·25	2·01	1·60	5·36	·43	3·63	1·86	1·02	6·91	4·57	·54	1·45
Fife K. & C. ...	1·22	2·54	2·33	2·25	1·14	1·39	1·53	3·10	·62	7·35	2·36	2·15	2·75	4·65	1·88	2·29	2·42	1·42
Forfar ...	·53	·06	·57	·65	2·20	8·00	3·47	4·67	2·29	·71	1·13	·33	1·93	1·04	4·89	3·16	4·84	4·71
Dundee ...	3·71	·33	3·93	·97	1·34	·31	5·82	2·26	4·14	5·85	·12	3·13	2·04	1·94	2·13	6·21	4·41	3·70
Haddington ...	·47	1·13	1·52	2·15	1·13	5·18	1·26	1·08	1·80	3·58	·54	2·46	·83	1·31	3·32	1·24	2·46	1·44
Inverness ...	2·15	·82	6·93	5·18	4·04	8·73	·55	4·75	1·47	·91	1·21	7·23	5·69	8·60	10·61	·01	7·96	·13
Kincardine ...	·11	·16	3·03	3·96	1·15	1·20	3·46	1·24	1·40	4·36	1·47	4·53	·33	·94	1·90	4·04	2·76	2·97
Kirkcudbright ...	2·01	·70	2·02	4·29	1·32	1·92	1·29	2·84	·15	1·41	·72	2·13	1·20	·51	·90	4·62	2·53	1·48
Lanark ...	1·52	·07	·24	1·58	·66	8·48	1·25	6·34	1·33	2·29	1·01	1·16	2·95	4·86	4·92	1·48	2·57	·30
Glasgow ...	11·28	1·09	6·92	4·29	1·43	17·44	·97	4·66	8·49	22·71	1·81	9·26	13·42	1·31	13·73	2·03	6·22	6·95
Govan ...	7·66	·78	7·50	·53	·05	·09	·27	2·27	2·93	12·27	·08	9·36	2·18	·83	2·03	1·36	2·31	2·80
Linlithgow ...	1·35	2·12	2·75	5·45	·63	·83	2·98	·45	3·09	4·91	·61	·96	3·60	2·61	·49	1·66	·58	1·60
Orkney ...	3·30	·91	2·25	·34	·38	3·70	·31	1·62	5·31	4·85	·27	2·26	2·28	·06	3·99	·16	·68	4·33
Perth ...	4·22	2·34	4·45	·96	4·45	3·25	·33	3·03	1·02	3·66	·19	4·40	·15	3·89	2·89	·57	1·79	·16
Renfrew ...	3·69	·42	3·47	·45	1·50	·90	2·55	1·57	·28	8·16	1·30	4·40	3·53	2·11	2·83	1·43	2·62	1·05
Ross & Cromarty	3·93	·06	6·92	2·65	5·14	9·20	·63	3·10	5·02	4·78	·38	6·82	1·68	5·23	9·15	1·49	1·85	4·07
Roxburgh ...	4·31	1·24	1·97	2·57	·49	4·51	·74	5·26	1·27	4·42	1·54	2·39	2·80	·75	2·41	·70	4·05	1·70
Selkirk & P. ...	·82	·64	5·92	6·16	·50	1·23	2·87	2·94	1·20	·61	·71	4·82	4·94	1·00	·34	1·61	2·89	1·74
Shetland ...	1·84	1·88	2·86	·21	·95	11·71	5·05	3·80	·09	4·56	·88	3·23	1·76	1·18	9·71	4·55	3·31	·43
Stirling ...	·88	2·09	·28	2·03	1·00	1·03	·08	·27	1·09	·78	2·21	3·27	1·78	·01	·54	·64	·84	·22
Sutherland ...	·94	2·19	4·43	4·83	·10	3·23	3·04	·93	1·66	3·58	·44	2·03	1·20	·18	4·25	2·45	·73	3·01
Wigtown ...	·44	1·38	2·29	1·21	·92	3·72	2·33	·31	·24	1·41	·34	2·97	1·73	1·38	5·23	·45	3·85	·34

TABLE XI.

District Totals.

BOYS

Number of District	Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark	
I	592	119	849	504	36	281	594	719	506	2100
II	464	111	557	308	22	378	305	401	378	1462
III	533	136	1153	555	25	345	660	881	516	2402
IV	391	66	668	442	22	240	508	478	363	1589
V	963	174	1394	883	53	444	1084	1178	761	3467
VI	931	214	1547	904	50	369	1171	1294	812	3646
VII	536	103	855	557	24	258	611	781	425	2075
VIII	260	60	365	205	13	109	361	278	155	903
IX	765	127	1063	639	29	293	912	867	551	2623
X	286	63	655	272	7	163	389	484	247	1283
XI	837	190	1826	936	44	474	1134	1397	828	3833
XII	664	170	1171	781	18	317	960	936	591	2804
XIII	9161	2227	18999	10658	481	4964	12679	13887	9996	41526
XIV	650	154	1222	782	27	416	837	892	690	2835
XV	360	102	772	354	18	168	536	599	303	1606
XVI	360	79	569	374	7	242	362	491	294	1389
XVII	388	87	656	404	19	226	533	485	310	1554
XVIII	626	128	1069	550	62	417	659	783	576	2435
XIX	224	66	485	232	10	82	352	385	198	1017
XX	79	9	81	56	3	18	88	65	57	228
XXI	282	50	497	244	16	164	322	385	218	1089
XXII	157	32	311	190	17	105	204	220	178	707
XXIII	55	10	152	56	5	31	81	118	48	278
XXIV	760	198	1749	946	47	546	1073	1205	876	3700
XXV	340	88	507	368	18	169	447	392	313	1321
XXVI	673	115	1029	560	30	408	660	831	508	2407
XXVII	522	127	1002	522	21	309	754	672	459	2194
XXVIII	1044	192	1451	837	68	612	1157	1049	774	3592
XXIX	359	81	592	388	11	304	414	391	322	1431
XXX	833	143	1178	600	22	501	954	811	510	2776
XXXI	515	98	905	652	24	285	639	738	532	2194
XXXII	400	101	657	431	22	318	430	515	348	1611
XXXIII	173	41	300	231	11	105	215	255	181	756
XXXIV	601	154	1042	711	22	402	807	750	571	2530
XXXV	421	88	727	378	16	162	562	601	305	1630
XXXVI	479	97	725	453	24	250	619	552	357	1778
XXXVII	819	130	1382	698	13	493	892	1036	621	3042
XXXVIII	347	61	432	241	13	156	377	327	234	1094
XXXIX	466	108	736	412	23	347	497	470	431	1745
XL	307	68	578	224	14	217	268	452	254	1191
XLI	214	60	502	198	11	121	330	326	208	985
XLII	453	68	539	350	18	234	487	418	289	1428
XLIII	497	123	912	466	31	380	589	641	419	2029
XLIV	2584	529	4220	2388	98	1484	2927	2992	2416	9819
XLV	1365	343	2630	1411	42	611	1888	1978	1314	5791
XLVI	643	137	1024	531	22	378	753	733	493	2357
XLVII	795	160	1343	695	24	571	858	939	649	3017
XLVIII	822	219	1577	776	42	395	1140	1203	698	3436
XLIX	477	92	701	318	16	323	485	461	335	1604
L	207	43	412	280	19	141	243	355	222	961
LI	523	94	868	487	9	262	660	655	404	1981
LII	506	69	643	456	19	257	538	492	406	1693
LIII	588	115	1072	540	13	321	751	770	486	2328
LIV	338	73	642	309	19	243	374	466	298	1381
LV	454	86	726	414	36	256	538	526	396	1716

TABLE XI.—(*continued*).

District Totals.

BOYS

Number of District	Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark	
LVI	254	45	364	218	17	140	261	276	221	898
LVII	863	213	1749	847	38	476	1004	1424	806	3710
LVIII	283	68	560	325	15	187	390	434	240	1251
LIX	528	78	676	455	33	328	602	467	373	1770
LX	307	78	699	340	23	150	453	502	342	1447
LXI	471	96	737	477	35	356	498	577	385	1816
LXII	490	113	960	595	34	307	611	814	460	2192
LXIII	316	51	587	341	16	212	392	376	331	1311
LXIV	302	53	528	353	5	175	342	361	363	1241
LXV	435	114	911	469	22	380	576	570	425	1951
LXVI	2038	476	3964	2152	122	1270	2409	2950	2123	8752
LXVII	250	51	338	246	17	114	272	314	202	902
LXVIII	401	81	535	328	23	316	326	392	334	1368
LXIX	645	109	1042	579	20	278	710	820	587	2395
LXX	358	62	428	301	26	231	296	349	299	1175
LXXI	329	53	470	328	34	199	435	317	263	1214
LXXII	364	68	509	347	8	178	433	394	291	1296
LXXIII	271	65	531	267	10	191	360	355	238	1144
LXXIV	296	66	447	346	14	171	377	365	256	1169
LXXV	308	60	524	269	12	212	334	384	243	1173
LXXVI	76	12	145	86	12	66	83	106	76	331
LXXVII	2868	727	5061	2943	86	1494	3613	3908	2670	11685
LXXVIII	480	105	748	402	28	232	491	672	368	1763
LXXIX	369	107	714	447	17	301	532	516	305	1654
LXXX	703	176	1025	598	42	495	744	822	483	2544
LXXXI	406	102	817	451	27	218	506	635	444	1803
LXXXII	416	103	789	402	17	262	575	561	329	1727
LXXXIII	511	104	791	445	36	366	548	639	334	1887
LXXXIV	332	114	708	373	14	281	471	493	296	1541
LXXXV	631	166	1201	599	17	304	738	969	603	2614
LXXXVI	271	66	465	240	16	186	290	346	236	1058
LXXXVII	530	116	767	485	14	304	512	639	457	1912
LXXXVIII	537	84	578	378	18	371	427	421	376	1595
LXXXIX	317	75	561	245	13	161	365	459	226	1211
XC	295	78	448	299	23	272	334	296	241	1143
XCI	298	62	301	254	28	218	271	256	198	943
XCII	346	90	611	393	28	235	380	544	309	1468
XCIII	450	78	574	431	19	329	479	444	300	1552
XCIV	85	21	136	96	9	111	112	71	53	347
XCV	236	61	396	324	31	148	341	359	200	1048
XCVI	255	76	366	316	9	217	250	313	242	1022
XCVII	489	104	605	454	53	206	460	614	425	1705
XCVIII	222	65	536	290	15	155	345	362	266	1128
XCIX	466	97	599	521	40	305	552	482	384	1723
C	303	60	364	330	28	185	367	318	215	1085
CI	288	69	475	379	17	143	443	399	243	1228
CII	261	42	384	391	13	130	466	294	201	1091
CIII	343	67	590	404	22	254	371	509	292	1426
CIV	351	111	786	441	34	197	539	603	384	1723
CV	676	111	915	644	38	412	750	662	560	2384
CVI	288	35	433	226	10	86	323	379	204	992
CVII	145	17	219	163	7	105	173	157	116	551
CVIII	544	91	814	479	33	391	598	556	416	1961
CIX	565	101	819	496	27	353	615	691	349	2008
CX	371	91	540	346	21	354	329	382	304	1369

TABLE XII.

District Totals.

GIRLS

Number of District	Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark	
I	544	97	677	451	14	269	512	600	402	1783
II	459	83	525	280	16	289	387	325	362	1363
III	628	118	1014	522	20	348	675	831	448	2302
IV	412	89	667	416	19	307	419	496	381	1603
V	1003	177	1229	819	37	431	1029	1056	749	3265
VI	978	165	1384	794	30	366	1129	1126	730	3351
VII	551	110	779	470	15	254	562	681	428	1925
VIII	293	51	375	196	13	176	293	295	164	928
IX	642	102	956	607	23	288	809	677	556	2330
X	364	60	549	267	4	162	394	421	267	1244
XI	897	196	1515	899	37	419	1015	1282	828	3544
XII	677	164	1074	636	35	320	949	804	563	2636
XIII	8648	1952	17529	11151	484	4977	11982	13134	9671	39764
XIV	701	114	1166	755	23	421	849	838	651	2759
XV	326	82	693	323	11	145	473	507	310	1435
XVI	361	51	468	357	12	127	381	462	279	1249
XVII	358	69	604	402	16	162	473	495	319	1449
XVIII	575	121	977	605	56	435	636	705	558	2334
XIX	223	63	480	255	15	92	352	359	233	1036
XX	83	8	90	60	5	11	90	64	81	246
XXI	231	41	425	235	12	168	235	329	212	944
XXII	184	32	290	169	9	87	227	202	168	684
XXIII	70	12	126	93	7	39	99	102	68	308
XXIV	762	178	1569	984	32	504	1039	1177	805	3525
XXV	332	59	511	333	6	177	425	364	275	1241
XXVI	770	128	933	497	26	430	671	782	471	2354
XXVII	470	89	977	507	15	274	700	637	447	2058
XXVIII	1049	163	1296	827	35	605	1092	947	726	3370
XXIX	444	66	608	335	24	263	348	552	314	1477
XXX	811	147	1060	590	31	489	869	764	517	2639
XXXI	570	102	810	527	26	311	574	665	485	2035
XXXII	457	89	582	449	26	331	447	466	359	1603
XXXIII	217	32	317	213	8	130	240	220	197	787
XXXIV	640	111	875	597	30	335	777	668	473	2253
XXXV	385	62	561	359	14	153	480	460	288	1381
XXXVI	595	86	636	403	26	212	602	585	347	1746
XXXVII	948	140	1173	650	29	482	892	938	628	2940
XXXVIII	333	55	391	221	13	147	331	285	250	1013
XXXIX	478	93	603	376	22	280	463	447	382	1572
XL	302	62	477	205	12	188	269	381	220	1058
XLI	244	49	466	217	8	120	315	338	211	984
XLII	443	64	467	291	12	208	437	376	256	1277
XLIII	625	108	770	496	18	353	637	595	432	2017
XLIV	2593	485	4008	2518	139	1437	2908	2996	2402	9743
XLV	1602	289	2443	1448	36	642	1913	2009	1254	5818
XLVI	684	138	940	493	14	348	694	736	491	2269
XLVII	943	172	1265	574	23	530	883	946	618	2977
XLVIII	943	186	1344	785	24	440	1005	1130	707	3282
XLIX	516	66	572	318	14	281	493	380	332	1486
L	254	41	372	223	8	90	255	314	239	898
LI	516	73	735	413	7	218	588	578	360	1744
LII	601	55	585	377	11	301	472	456	400	1629
LIII	691	121	975	507	12	318	745	770	473	2306
LIV	413	65	571	277	11	222	372	443	300	1337
LV	532	89	608	430	22	244	518	478	441	1681

TABLE XII.—(*continued*).

District Totals.

GIRLS

Number of District	Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark	
LVI	263	48	313	220	19	133	247	260	223	863
LVII	923	154	1474	829	20	466	880	1271	783	3400
LVIII	336	73	505	325	16	186	394	416	259	1255
LIX	521	79	648	417	37	306	629	426	341	1702
LX	374	60	695	357	12	165	442	515	376	1498
LXI	510	78	585	394	24	315	451	455	370	1591
LXII	519	86	900	525	41	316	553	751	451	2071
LXIII	271	49	510	337	11	182	350	352	294	1178
LXIV	280	63	505	372	14	138	360	370	366	1234
LXV	426	94	809	408	21	322	485	523	428	1758
LXVI	2084	424	3560	2229	120	1178	2295	2880	2064	8417
LXVII	242	47	289	206	16	130	234	244	192	800
LXVIII	432	70	500	296	22	265	323	394	338	1320
LXIX	643	113	988	539	14	296	657	807	537	2297
LXX	360	62	306	268	30	227	256	275	268	1026
LXXI	325	52	411	321	21	190	397	311	232	1130
LXXII	374	48	494	282	16	186	386	340	302	1214
LXXIII	299	62	450	236	11	183	364	278	233	1058
LXXIV	375	79	400	294	13	186	392	365	218	1161
LXXV	307	62	360	236	18	172	270	309	232	983
LXXVI	92	15	99	77	10	67	74	92	60	293
LXXVII	2903	594	4342	2725	73	1482	3168	3582	2405	10637
LXXVIII	520	101	714	411	22	231	522	659	356	1768
LXXIX	457	84	582	411	21	257	544	439	315	1555
LXXX	754	132	807	535	34	446	721	670	425	2262
LXXXI	439	84	706	474	26	234	471	583	441	1729
LXXXII	509	80	684	396	18	233	533	569	352	1687
LXXXIII	569	101	704	413	31	324	538	586	370	1818
LXXXIV	364	63	648	313	27	240	451	432	292	1415
LXXXV	728	170	1139	597	15	276	772	952	649	2649
LXXXVI	341	79	457	251	17	234	304	354	253	1145
LXXXVII	634	112	753	421	20	345	538	619	438	1940
LXXXVIII	509	79	540	364	26	336	374	442	366	1518
LXXXIX	319	58	468	259	7	158	311	413	229	1111
XC	385	92	422	279	21	271	325	353	250	1199
XCI	327	57	275	243	31	216	256	251	210	933
XCII	350	65	545	411	17	254	385	448	301	1388
XCIII	507	64	574	405	33	335	494	457	297	1583
XCIV	93	35	91	104	7	98	117	71	44	330
XCV	270	41	380	301	19	140	297	332	242	1011
XCVI	349	52	360	227	11	226	290	245	238	999
XCVII	465	71	502	386	38	211	434	472	345	1462
XCVIII	279	46	494	261	12	146	341	326	279	1092
XCIX	484	61	494	481	33	306	473	410	364	1553
C	284	53	296	316	36	167	313	301	204	985
CI	298	56	430	341	16	147	389	381	224	1141
CII	258	54	337	291	14	134	372	258	190	954
CIII	387	59	535	375	32	232	414	439	303	1388
CIV	412	90	671	442	26	200	529	554	358	1641
CV	660	73	765	657	34	363	733	600	493	2189
CVI	294	29	388	213	3	68	330	328	201	927
CVII	104	31	205	122	12	99	168	99	108	474
CVIII	506	90	692	462	38	368	490	537	393	1788
CIX	573	87	672	405	21	321	536	577	324	1758
CX	378	64	408	261	18	284	272	310	263	1129

TABLE XIII.

District Percentages.

BOYS

Number of District	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
I	28·19	5·67	40·43	24·00	1·71	13·38	28·29	34·24	24·09
II	31·74	7·59	38·10	21·07	1·50	25·86	20·86	27·43	25·85
III	22·19	5·66	48·00	23·11	1·04	14·36	27·48	36·68	21·48
IV	24·61	4·15	42·04	27·82	1·38	15·10	31·97	30·08	22·85
V	27·77	5·02	40·21	25·47	1·53	12·81	31·26	33·98	21·95
VI	25·54	5·87	42·43	24·79	1·37	10·12	32·12	35·49	22·27
VII	25·83	4·96	41·21	26·84	1·16	12·43	29·45	37·64	20·48
VIII	28·79	6·65	40·42	22·70	1·44	12·07	39·98	30·79	17·16
IX	29·16	4·84	40·53	24·36	1·11	11·17	34·77	33·05	21·01
X	22·29	4·91	51·05	21·20	·55	12·71	30·32	37·72	19·25
XI	21·83	4·96	47·64	24·42	1·15	12·37	29·59	36·44	21·60
XII	23·68	6·06	41·76	27·86	·64	11·30	34·24	33·38	21·08
XIII	22·07	5·36	45·75	25·66	1·16	11·96	30·53	33·44	24·07
XIV	22·93	5·43	43·11	27·58	·95	14·67	29·53	31·46	24·34
XV	22·42	6·35	48·07	22·04	1·12	10·46	33·37	37·30	18·87
XVI	25·92	5·69	40·96	26·93	·50	17·42	26·06	35·35	21·17
XVII	24·97	5·60	42·20	26·00	1·23	14·54	34·30	31·21	19·95
XVIII	25·71	5·26	43·90	22·59	2·54	17·13	27·06	32·16	23·65
XIX	22·03	6·49	47·69	22·81	·98	8·06	34·61	37·86	19·47
XX	34·65	3·95	35·52	24·56	1·32	7·89	38·60	28·51	25·00
XXI	25·89	4·59	45·64	22·41	1·47	15·06	29·57	35·35	20·02
XXII	22·21	4·53	43·99	26·87	2·40	14·85	28·85	31·12	25·18
XXIII	19·78	3·60	54·68	20·14	1·80	11·15	29·14	42·44	17·27
XXIV	20·54	5·35	47·27	25·57	1·27	14·76	29·00	32·57	23·67
XXV	25·74	6·66	38·38	27·86	1·36	12·79	33·84	29·68	23·69
XXVI	27·96	4·78	42·75	23·26	1·25	16·95	27·42	34·52	21·11
XXVII	23·79	5·79	45·67	23·79	·96	14·08	34·37	30·63	20·92
XXVIII	29·07	5·35	40·39	23·30	1·89	17·04	32·21	29·20	21·55
XXIX	25·09	5·66	41·37	27·11	·77	21·25	28·93	27·32	22·50
XXX	30·01	5·15	42·44	21·61	·79	18·05	34·37	29·21	18·37
XXXI	23·47	4·47	41·25	29·72	1·09	12·99	29·12	33·64	24·25
XXXII	24·83	6·27	40·78	26·75	1·37	19·74	26·69	31·97	21·60
XXXIII	22·88	5·42	39·68	30·56	1·46	13·89	28·44	33·73	23·94
XXXIV	23·76	6·09	41·18	28·10	·87	15·89	31·90	29·64	22·57
XXXV	25·83	5·40	44·60	23·19	·98	9·94	34·48	36·87	18·71
XXXVI	26·94	5·45	40·78	25·48	1·35	14·06	34·81	31·05	20·08
XXXVII	26·92	4·27	45·43	22·95	·43	16·21	29·32	34·06	20·41
XXXVIII	31·72	5·57	39·49	22·03	1·19	14·26	34·46	29·89	21·39
XXXIX	26·70	6·19	42·18	23·61	1·32	19·89	28·48	26·93	24·70
XL	25·78	5·71	48·53	18·81	1·17	18·22	22·50	37·95	21·33
XLI	21·73	6·09	50·96	20·10	1·12	12·28	33·50	33·10	21·12
XLII	31·72	4·76	37·75	24·51	1·26	16·39	34·10	29·27	20·24
XLIII	24·49	6·06	44·95	22·97	1·53	18·73	29·03	31·59	20·65
XLIV	26·31	5·39	42·98	24·32	1·00	15·11	29·81	30·47	24·61
XLV	23·57	5·92	45·42	24·37	·72	10·55	32·60	34·16	22·69
XLVI	27·28	5·81	43·45	22·53	·93	16·04	31·94	31·10	20·92
XLVII	26·35	5·30	44·52	23·04	·79	18·93	28·44	31·12	21·51
XLVIII	23·92	6·37	45·90	22·59	1·22	11·50	33·18	35·01	20·31
XLIX	29·74	5·74	43·70	19·82	1·00	20·14	30·24	28·74	20·88
L	21·54	4·47	42·87	29·14	1·98	14·67	25·29	36·94	23·10
LI	26·40	4·75	43·82	24·58	·45	13·23	33·32	33·06	20·39
LII	29·89	4·08	37·98	26·93	1·12	15·18	31·78	29·06	23·98
LIII	25·26	4·94	46·05	23·19	·56	13·79	32·26	33·08	20·87
LIV	24·47	5·29	46·49	22·37	1·38	17·60	27·08	33·74	21·58
LV	26·46	5·01	42·31	24·12	2·10	14·92	31·35	30·65	23·08

TABLE XIII.—(*continued*).

District Percentages.

BOYS

Number of District	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
LVI	28·29	5·01	40·53	24·28	1·89	15·59	29·06	30·74	24·61
LVII	23·26	5·74	47·14	22·83	1·03	12·83	27·06	38·38	21·73
LVIII	22·62	5·43	44·77	25·98	1·20	14·95	31·17	34·69	19·19
LIX	29·83	4·41	38·19	25·71	1·86	18·53	34·01	26·39	21·07
LX	21·21	5·39	48·31	23·50	1·59	10·37	31·31	34·69	23·63
LXI	25·94	5·28	40·58	26·27	1·93	19·61	27·42	31·77	21·20
LXII	22·35	5·16	43·80	27·14	1·55	14·01	27·87	37·13	20·99
LXIII	24·10	3·89	44·78	26·01	1·22	16·17	29·90	28·68	25·25
LXIV	24·33	4·27	42·55	28·45	·40	14·10	27·56	29·09	29·25
LXV	22·30	5·84	46·69	24·04	1·13	19·48	29·52	29·22	21·78
LXVI	23·29	5·44	45·29	24·59	1·39	14·51	27·52	33·71	24·26
LXVII	27·73	5·64	37·47	27·27	1·89	12·64	30·16	34·81	22·39
LXVIII	29·31	5·92	39·11	23·98	1·68	23·10	23·83	28·65	24·42
LXIX	26·93	4·55	43·51	24·18	·83	11·61	29·64	34·24	24·51
LXX	30·47	5·28	36·42	25·62	2·21	19·66	25·19	29·70	25·45
LXXI	27·10	4·37	38·71	27·02	2·80	16·39	35·83	26·11	21·67
LXXII	28·09	5·25	39·27	26·77	·62	13·74	33·41	30·40	22·45
LXXIII	23·69	5·68	46·42	23·34	·87	16·70	31·47	31·03	20·80
LXXIV	25·32	5·64	38·24	29·60	1·20	14·63	32·25	31·22	21·90
LXXV	26·26	5·12	44·67	22·93	1·02	18·07	28·48	32·74	20·71
LXXVI	22·96	3·62	43·81	25·98	3·63	19·94	25·08	32·02	22·96
LXXVII	24·54	6·22	43·31	25·19	·74	12·79	30·92	33·44	22·85
LXXVIII	27·23	5·95	42·43	22·80	1·59	13·16	27·85	38·12	20·87
LXXIX	22·31	6·47	43·17	27·02	1·03	18·20	32·16	31·20	18·44
LXXX	27·63	6·92	40·29	23·51	1·65	19·46	29·24	32·31	18·99
LXXXI	22·52	5·66	45·31	25·01	1·50	12·09	28·06	35·22	24·63
LXXXII	24·09	5·96	45·69	23·28	·98	15·17	33·30	32·48	19·05
LXXXIII	27·08	5·51	41·92	23·58	1·91	19·40	29·04	33·86	17·70
LXXXIV	21·54	7·40	45·94	24·21	·91	18·24	30·56	31·99	19·21
LXXXV	24·14	6·35	45·94	22·92	·65	11·63	28·23	37·07	23·07
LXXXVI	25·61	6·24	43·95	22·69	1·51	17·58	27·41	32·70	22·31
LXXXVII	27·72	6·07	40·11	25·37	·73	15·90	26·78	33·42	23·90
LXXXVIII	33·67	5·26	36·24	23·70	1·13	23·26	26·77	26·40	23·57
LXXXIX	26·18	6·19	46·33	20·23	1·07	13·30	30·14	37·90	18·66
XC	25·81	6·82	39·20	26·16	2·01	23·80	29·22	25·90	21·08
XCI	31·60	6·58	31·92	26·93	2·97	23·12	28·74	27·15	20·99
XCII	23·57	6·13	41·62	26·77	1·91	16·01	25·88	37·06	21·05
XCIII	29·00	5·03	36·98	27·77	1·22	21·20	30·86	28·61	19·33
XCIV	24·50	6·05	39·19	27·67	2·59	31·98	32·29	20·46	15·27
XCV	22·52	5·82	37·78	30·92	2·96	14·12	32·54	34·26	19·08
XCVI	24·95	7·44	35·81	30·92	·88	21·23	24·46	30·63	23·68
XCVII	28·68	6·10	35·48	26·63	3·11	12·08	26·98	36·01	24·93
XCVIII	19·68	5·76	47·52	25·71	1·33	13·74	30·59	32·09	23·58
XCIX	27·04	5·63	34·77	30·24	2·32	17·70	32·04	27·97	22·29
C	27·93	5·53	33·55	30·41	2·58	17·05	33·82	29·31	19·82
CI	23·45	5·62	38·68	30·86	1·39	11·65	36·07	32·49	19·79
CII	23·92	3·85	35·20	35·84	1·19	11·92	42·71	26·95	18·42
CIII	24·05	4·70	41·38	28·33	1·54	17·81	26·02	35·69	20·48
CIV	20·37	6·44	45·62	25·60	1·97	11·43	31·28	35·00	22·29
CV	28·36	4·66	38·38	27·01	1·59	17·28	31·46	27·77	23·49
CVI	29·03	3·53	43·65	22·78	1·01	8·67	32·56	38·21	20·56
CVII	26·32	3·08	39·75	29·58	1·27	19·06	31·40	28·49	21·05
CVIII	27·74	4·64	41·51	24·43	1·68	19·94	30·50	28·35	21·21
CIX	28·14	5·03	40·79	24·70	1·34	17·58	30·63	34·41	17·38
CX	27·10	6·65	39·45	25·27	1·53	25·86	24·03	27·90	22·21

TABLE XIV.

District Percentages.

GIRLS

Number of District	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
I	30·51	5·44	37·97	25·30	·78	15·09	28·72	33·65	22·54
II	33·68	6·09	38·52	20·54	1·17	21·20	28·39	23·85	26·56
III	27·28	5·12	44·05	22·68	·87	15·12	29·32	36·10	19·46
IV	25·70	5·55	41·61	25·95	1·19	19·15	26·14	30·94	23·77
V	30·72	5·42	37·64	25·09	1·13	13·20	31·52	32·34	22·94
VI	29·19	4·92	41·30	23·70	·89	10·92	33·69	33·60	21·79
VII	28·62	5·71	40·47	24·42	·78	13·20	29·19	35·38	22·23
VIII	31·57	5·50	40·41	21·12	1·40	18·97	31·57	31·79	17·67
IX	27·55	4·38	41·03	26·05	·99	12·36	34·72	29·06	23·86
X	29·26	4·82	44·13	21·46	·32	13·02	31·67	33·84	21·46
XI	25·31	5·53	42·75	25·37	1·04	11·82	28·64	36·18	23·36
XII	25·68	6·22	40·74	26·03	1·33	12·14	36·00	30·50	21·36
XIII	21·75	4·91	44·08	28·04	1·22	12·52	30·13	33·03	24·32
XIV	25·41	4·13	42·26	27·37	·83	15·26	30·77	30·37	23·60
XV	22·72	5·71	48·29	22·51	·77	10·11	32·96	35·33	21·60
XVI	28·91	4·08	37·47	28·58	·96	10·17	30·50	36·99	22·34
XVII	24·71	4·76	41·68	27·74	1·11	11·18	32·64	34·16	22·02
XVIII	24·64	5·18	41·86	25·92	2·40	18·64	27·25	30·20	23·91
XIX	21·53	6·08	46·33	24·61	1·45	8·88	33·98	34·65	22·49
XX	33·74	3·25	36·59	24·39	2·03	4·47	36·58	26·02	32·93
XXI	24·47	4·34	45·02	24·90	1·27	17·80	24·89	34·85	22·46
XXII	26·90	4·68	42·40	24·71	1·31	12·72	33·19	29·53	24·56
XXIII	22·73	3·90	40·91	30·19	2·27	12·66	32·14	33·12	22·08
XXIV	21·62	5·05	44·51	27·91	·91	14·30	29·47	33·39	22·84
XXV	26·75	4·76	41·18	26·83	·48	14·26	34·25	29·33	22·16
XXVI	32·71	5·44	39·63	21·11	1·11	18·27	28·50	33·22	20·01
XXVII	22·84	4·33	47·47	24·63	·73	13·32	34·01	30·95	21·72
XXVIII	31·13	4·84	38·45	24·54	1·04	17·95	32·41	28·10	21·54
XXIX	30·06	4·47	41·16	22·68	1·63	17·81	23·56	37·37	21·26
XXX	30·73	5·57	40·17	22·36	1·17	18·53	32·93	28·95	19·59
XXXI	28·01	5·01	39·80	25·90	1·28	15·28	28·21	32·68	23·83
XXXII	28·51	5·55	36·31	28·01	1·62	20·65	27·88	29·07	22·40
XXXIII	27·57	4·07	40·28	27·06	1·02	16·52	30·50	27·95	25·03
XXXIV	28·41	4·93	38·83	26·50	1·33	14·87	34·49	29·65	20·99
XXXV	27·88	4·49	40·62	26·00	1·01	11·08	34·76	33·31	20·85
XXXVI	34·08	4·93	36·42	23·08	1·49	12·14	34·48	33·51	19·87
XXXVII	32·24	4·76	39·90	22·11	·99	16·39	30·34	31·91	21·36
XXXVIII	32·87	5·43	38·60	21·82	1·28	14·51	32·68	28·13	24·68
XXXIX	30·41	5·91	38·36	23·92	1·40	17·81	29·45	28·44	24·30
XL	28·54	5·86	45·09	19·38	1·13	17·77	25·43	36·01	20·79
XLI	24·80	4·98	47·36	22·05	·81	12·20	32·01	34·35	21·44
XLII	34·69	5·01	36·57	22·79	·94	16·29	34·22	29·44	20·05
XLIII	30·99	5·35	38·18	24·59	·89	17·50	31·58	29·50	21·42
XLIV	26·61	4·98	41·14	25·84	1·43	14·75	29·85	30·75	24·65
XLV	27·53	4·97	41·99	24·89	·62	11·04	32·88	34·53	21·55
XLVI	30·14	6·08	41·43	21·73	·62	15·34	30·58	32·44	21·64
XLVII	31·68	5·78	42·49	19·28	·77	17·80	29·66	31·78	20·76
XLVIII	28·73	5·67	40·95	23·92	·73	13·41	30·62	34·43	21·54
XLIX	34·73	4·44	38·49	21·40	·94	18·91	33·18	25·57	22·34
L	28·29	4·57	41·42	24·83	·89	10·02	28·40	34·97	26·61
LI	29·59	4·19	42·14	23·68	·40	12·50	33·72	33·14	20·64
LII	36·89	3·38	35·91	23·14	·68	18·48	28·98	27·99	24·55
LIII	29·96	5·25	42·28	21·99	·52	13·79	32·31	33·39	20·51
LIV	30·89	4·86	42·71	20·72	·82	16·61	27·82	33·13	22·44
LV	31·65	5·29	36·17	25·58	1·31	14·51	30·82	28·44	26·23

TABLE XIV.—(*continued*).

District Percentages.

GIRLS

Number of District	Hair					Eyes			
	Fair	Red	Medium	Dark	Jet Black	Pure Blue	Light	Medium	Dark
LVI	30·48	5·56	36·27	25·49	2·20	15·41	28·62	30·13	25·84
LVII	27·15	4·53	43·35	24·38	·59	13·71	25·88	37·38	23·03
LVIII	26·77	5·82	40·24	25·90	1·27	14·82	31·39	33·15	20·64
LIX	30·61	4·64	38·07	24·50	2·18	17·98	36·96	25·03	20·03
LX	24·97	4·01	46·39	23·83	·80	11·01	29·51	34·38	25·10
LXI	32·06	4·90	36·77	24·76	1·51	19·80	28·35	28·60	23·25
LXII	25·06	4·15	43·46	25·35	1·98	15·26	26·70	36·26	21·78
LXIII	23·01	4·16	43·29	28·61	·93	15·45	29·71	29·88	24·96
LXIV	22·69	5·11	40·92	30·15	1·13	11·18	29·17	29·99	29·66
LXV	24·23	5·35	46·02	23·21	1·19	18·32	27·59	29·75	24·34
LXVI	24·76	5·04	42·29	26·48	1·43	13·99	27·27	34·22	24·52
LXVII	30·25	5·87	36·13	25·75	2·00	16·25	29·25	30·50	24·00
LXVIII	32·73	5·30	37·88	22·42	1·67	20·08	24·47	29·85	25·60
LXIX	27·99	4·92	43·01	23·47	·61	12·89	28·60	35·13	23·38
LXX	35·09	6·04	29·83	26·12	2·92	22·13	24·95	26·80	26·12
LXXI	28·76	4·60	36·37	28·41	1·86	16·82	35·13	27·52	20·53
LXXII	30·81	3·95	40·69	23·23	1·32	15·32	31·80	28·00	24·88
LXXIII	28·26	5·86	42·53	22·31	1·04	17·30	34·40	26·28	22·02
LXXIV	32·30	6·81	34·45	25·32	1·12	16·02	33·76	31·44	18·78
LXXV	31·23	6·31	36·62	24·01	1·83	17·50	27·47	31·43	23·60
LXXVI	31·40	5·12	33·79	26·28	3·41	22·87	25·25	31·40	20·48
LXXVII	27·29	5·58	40·82	25·62	·69	13·93	29·78	33·68	22·61
LXXVIII	29·41	5·71	40·39	23·25	1·24	13·06	29·53	37·27	20·14
LXXIX	29·39	5·40	37·43	26·43	1·35	16·53	34·98	28·23	20·26
LXXX	33·33	5·84	35·68	23·65	1·50	19·72	31·87	29·62	18·79
LXXXI	25·39	4·86	40·83	27·42	1·50	13·53	27·24	33·72	25·51
LXXXII	30·17	4·74	40·55	23·47	1·07	13·81	31·59	33·73	20·87
LXXXIII	31·30	5·56	38·72	22·72	1·70	17·82	29·59	32·24	20·35
LXXXIV	25·73	4·45	45·79	22·12	1·91	16·96	31·87	30·53	20·64
LXXXV	27·48	6·42	43·00	22·54	·56	10·42	29·14	35·94	24·50
LXXXVI	29·78	6·90	39·91	21·92	1·49	20·44	26·55	30·92	22·09
LXXXVII	32·68	5·77	38·82	21·70	1·03	17·78	27·73	31·91	22·58
LXXXVIII	33·53	5·20	35·58	23·98	1·71	22·13	24·64	29·12	24·11
LXXXIX	28·71	5·22	42·13	23·31	·63	14·22	27·99	37·18	20·61
XC	32·11	7·67	35·20	23·27	1·75	22·60	27·11	29·44	20·85
XCI	35·05	6·11	29·48	26·04	3·32	23·15	27·44	26·90	22·51
XCII	25·22	4·68	39·27	29·61	1·22	18·30	27·74	32·28	21·68
XCIII	32·03	4·04	36·26	25·58	2·09	21·16	31·21	28·87	18·76
XCIV	28·18	10·61	27·57	31·52	2·12	29·70	35·45	21·52	13·33
XCV	26·70	4·05	37·59	29·78	1·88	13·84	29·38	32·84	23·94
XCVI	34·93	5·21	36·04	22·72	1·10	22·62	29·03	24·53	23·82
XCVII	31·81	4·85	34·34	26·40	2·60	14·43	29·68	32·29	23·60
XCVIII	25·55	4·21	45·24	23·90	1·10	13·38	31·22	29·85	25·55
XCIX	31·17	3·93	31·81	30·97	2·12	19·70	30·46	26·40	23·44
C	28·83	5·38	30·05	32·08	3·66	16·95	31·78	30·56	20·71
CI	26·12	4·91	37·69	29·88	1·40	12·89	34·09	33·39	19·63
CII	27·04	5·66	35·33	30·50	1·47	14·05	38·99	27·04	19·92
CIII	27·88	4·25	38·54	27·02	2·31	16·71	29·83	31·63	21·83
CIV	25·11	5·48	40·89	26·93	1·59	12·19	32·24	33·76	21·81
CV	30·15	3·34	34·95	30·01	1·55	16·58	33·49	27·41	22·52
CVI	31·71	3·13	41·86	22·98	·32	7·34	35·60	35·38	21·68
CVII	21·94	6·54	43·25	25·74	2·53	20·89	35·44	20·89	22·78
CVIII	28·30	5·03	38·70	25·84	2·13	20·58	27·41	30·03	21·98
CIX	32·59	4·95	38·23	23·04	1·19	18·26	30·49	32·82	18·43
CX	33·48	5·67	36·14	23·12	1·59	25·16	24·09	27·46	23·29

TABLE XV.

County and Parish Data.

ABERDEEN.

Parish	BOYS										District	GIRLS									
	Hair					Eyes				Totals		Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Aberdeen (Burgh) ...	2868	727	5061	2943	86	1494	3613	3908	2670	11685	*77*	2903	594	4342	2725	73	1482	3168	3582	2405	10637
Aberdour	32	12	60	48	6	34	37	53	34	158	*83*	24	12	48	51	4	20	31	34	34	119
Aboyne & Glen Tanar	32	12	49	53	0	24	43	51	28	146	*79*	39	12	52	44	0	16	60	39	32	147
Alford	34	19	67	15	3	46	41	29	22	138	*80*	42	14	52	25	4	46	37	31	23	137
Ardallie	21	5	48	13	0	21	35	21	10	87	*82*	14	1	44	20	0	17	39	19	4	79
Auchterless ...	28	6	73	27	2	27	46	39	24	136	*82*	24	8	50	26	1	15	38	42	14	109
Belhelvie	49	7	62	34	5	29	28	64	36	157	*78*	54	8	74	21	2	26	36	56	41	159
Birse	13	2	27	28	0	7	29	25	9	70	*79*	28	2	18	20	0	13	27	21	7	68
Bourtie	8	4	4	6	0	3	8	0	11	22	*80*	8	3	4	4	0	4	10	0	5	19
Cairney	46	10	43	28	0	23	30	38	36	127	*87*	44	5	46	28	2	21	25	38	41	125
Chapel of Garioch ...	36	5	27	18	0	17	31	25	13	86	*80*	39	5	46	29	0	27	31	34	27	119
Clatt	11	3	8	7	0	3	20	4	2	29	*80*	15	1	9	9	0	3	25	3	3	34
Cluny	21	4	52	7	2	28	15	29	14	86	*80*	25	5	35	19	0	14	30	24	16	84
Coull	4	1	12	11	0	3	6	8	11	28	*79*	6	0	10	6	2	8	6	6	4	24
Crathie and Braemar	27	12	33	29	1	16	37	35	14	102	*79*	21	5	48	23	1	22	21	31	24	98
Cruden	58	10	85	46	8	37	58	53	59	207	*78*	64	5	71	57	8	25	66	57	57	205
Culsalmond	11	0	10	4	1	10	4	10	2	26	*80*	6	3	9	11	0	8	5	11	5	29
Drumblade	16	6	26	21	1	24	11	11	24	70	*87*	25	3	26	13	0	31	13	13	10	67
Drumoak	13	4	40	26	2	16	25	25	19	85	*79*	18	4	21	17	1	7	23	16	15	61
Dyce	29	5	53	49	1	36	36	33	22	137	*80*	27	4	35	31	0	12	45	21	19	97
Echt	20	6	41	31	0	29	22	26	21	98	*79*	42	4	40	28	0	25	33	37	19	114
Ellon	88	22	191	64	6	45	115	138	73	371	*82*	91	10	182	54	2	35	100	136	68	339
Fintray	13	2	24	28	0	2	30	25	10	67	*80*	11	1	27	25	0	2	27	23	12	64
Forgue	13	5	63	47	1	20	30	51	28	129	*87*	34	8	35	30	0	18	27	39	23	107
Foveran	36	9	106	35	3	9	62	86	32	189	*78*	59	8	88	39	0	16	71	75	32	194
Fraserburgh ...	303	56	437	230	12	176	314	391	157	1038	*83*	352	55	396	249	14	175	327	352	212	1066
Fyvie	50	12	97	41	0	13	78	79	30	200	*82*	81	12	59	50	4	12	78	68	48	206
Gartly	9	2	33	20	0	16	23	17	8	64	*87*	8	3	26	18	1	17	25	11	3	56
Glass	11	1	42	18	3	21	15	25	14	75	*87*	15	3	35	15	3	17	16	20	18	71
Glenbucket ...	16	7	9	1	0	16	11	3	3	33	*80*	13	4	6	7	0	11	10	0	9	30
Glenmuick & Tullich	55	8	65	31	1	25	45	60	30	160	*79*	54	7	65	38	2	16	44	69	37	166
Huntly	133	21	182	117	4	67	134	137	119	457	*87*	144	29	193	113	5	76	122	152	134	484
Insch	32	9	59	35	0	23	37	58	17	135	*80*	45	5	24	36	4	28	31	34	21	114
Inverurie	132	28	166	114	3	89	101	168	85	443	*80*	133	22	144	68	3	65	96	139	70	370
Keig	21	3	11	20	6	16	14	13	18	61	*80*	22	2	9	6	1	17	12	5	6	40
Keithhall & Kinkell	7	3	30	13	2	10	16	19	10	55	*80*	16	3	33	13	3	15	17	25	11	68
Kennethmont ...	38	8	13	19	1	19	31	10	19	79	*80*	37	4	23	19	0	12	39	19	13	83
Kincardine O'Neil ...	41	9	133	37	7	35	80	88	24	227	*79*	53	8	88	38	7	28	80	63	23	194
King Edward ...	27	4	15	6	0	0	27	11	14												

Keig	21	3	11	20	6	10	14	16	10	55	*80*	16	3	33	13	3	15	17	25	11	68		
Keithhall & Kinkell	7	3	30	13	2	10	16	19	10	55	*80*	37	4	23	19	0	12	39	19	13	83		
Kennethmont ...	38	8	13	19	1	19	31	10	19	79	*80*	53	8	88	38	7	28	80	63	23	194		
Kincardine O'Neil ...	41	9	133	37	7	35	80	88	24	227	*79*												

King Edward ...	27	4	15	6	0	0	27	11	14	52	*86*	28	9	13	10	0	0	31	12	17	60		
Kininmonth ...	20	3	22	25	0	29	1	32	8	70	*84*	20	0	24	11	1	18	7	18	13	56		
Kinellar	17	4	11	10	1	1	23	13	6	43	*80*	8	3	12	7	0	2	9	12	7	30		
Kintore	66	9	149	64	4	49	97	91	55	292	*80*	86	14	87	62	3	45	84	84	39	252		
Leochel Cushnie ...	38	15	64	45	5	38	65	28	36	167	*80*	47	15	47	46	1	41	57	30	28	156		
Leslie	10	5	12	18	0	0	21	13	11	45	*80*	8	2	16	7	0	0	16	3	14	33		
Logie Buchan ...	11	4	20	13	2	6	16	15	13	50	*78*	4	0	21	11	1	3	9	19	6	37		
Logie Coldstone ...	10	3	24	20	0	0	33	8	16	57	*79*	17	1	26	20	1	1	43	2	19	65		
Longside	48	10	98	46	1	49	41	71	42	203	*84*	48	8	99	44	1	46	41	84	29	200		
Lonmay	43	6	74	43	9	46	38	48	43	175	*83*	38	10	73	35	2	37	30	54	37	158		
Lumphanan ...	18	8	36	17	0	3	40	27	9	79	*79*	16	8	17	14	0	1	29	20	5	55		
Meldrum	39	13	96	54	0	32	61	69	40	202	*82*	54	12	76	54	1	39	46	56	56	197		
Methlick	55	10	54	40	2	29	67	31	34	161	*82*	59	2	65	43	1	31	66	36	37	170		
Midmar	17	7	38	21	0	19	27	23	14	83	*79*	9	4	26	26	0	19	19	13	14	65		
Millbrex	15	5	19	23	3	2	21	26	16	65	*82*	18	3	27	21	0	4	9	33	23	69		
Monquhitter ...	45	11	71	58	2	33	56	50	48	187	*82*	70	12	58	46	1	24	57	65	41	187		
Monymusk	18	13	54	35	1	15	33	48	25	121	*80*	41	5	40	32	1	14	34	48	23	119		
New Byth	39	7	40	28	5	44	24	32	19	119	*86*	43	7	60	25	3	68	18	26	26	138		
New Deer	74	22	176	79	6	66	100	122	69	357	*84*	85	10	169	81	7	61	107	112	72	352		
Newhills	122	31	223	99	0	43	150	183	99	475	*78*	124	36	221	106	2	37	154	204	94	489		
New Machar ...	42	12	66	54	4	3	57	69	49	178	*78*	39	6	70	47	0	3	65	70	24	162		
New Pitsligo ...	65	21	143	41	4	35	113	78	48	274	*84*	44	13	123	36	3	33	84	49	53	219		
Old Deer	68	34	162	134	3	40	137	148	76	401	*84*	81	21	148	95	14	31	121	125	82	359		
Old Machar	22	3	46	36	1	17	35	42	14	108	*78*	29	6	32	23	2	15	28	33	16	92		
Oyne	17	5	22	12	0	14	16	18	8	56	*80*	20	1	22	13	0	19	18	13	6	56		
Peterculter	125	24	113	75	3	87	67	135	51	340	*78*	113	24	123	73	6	88	71	117	63	339		
Peterhead (Burgh) ...	303	89	666	346	15	169	388	504	358	1419	*81*	316	73	557	369	19	167	367	468	332	1334		
" (Land'd) ...	54	9	118	87	11	39	66	110	64	279	*81*	58	10	111	92	6	42	57	89	89	277		
Pitsligo	68	19	129	66	2	78	77	70	59	284	*83*	77	16	101	56	3	63	74	72	44	253		
Premnay	15	0	24	21	0	0	11	38	11	60	*80*	16	4	12	17	0	3	14	19	13	49		
Rathen	65	11	91	58	7	32	82	77	41	232	*83*	78	8	86	42	8	29	76	74	43	222		
Rayne	23	3	67	11	0	12	28	48	16	104	*80*	23	3	56	13	1	22	21	41	12	96		
Rhynie	28	4	22	14	0	26	11	19	12	68	*87*	26	1	17	8	2	16	9	21	8	54		
St Fergus	49	4	33	18	1	10	52	21	22	105	*81*	65	1	38	13	1	25	47	26	20	118		
Savoch	15	3	20	13	0	0	22	23	6	51	*82*	32	0	27	24	0	8	18	38	19	83		
Skene	39	8	37	31	5	26	36	28	30	120	*79*	34	8	34	36	3	15	45	33	22	115		
Slains	15	5	27	10	2	1	18	25	15	59	*78*	34	8	14	34	1	18	22	28	23	91		
Strathdon	29	12	42	27	3	22	18	49	24	113	*80*	22	5	31	23	5	17	19	29	21	86		
Strichen	50	19	97	39	0	57	72	31	45	205	*84*	68	10	79	38	1	48	83	31	34	196		
Tarland	9	5	27	27	1	16	15	23	15	69	*79*	20	7	33	31	0	21	18	20	32	91		
Tarves	40	8	47	37	1	45	17	44	27	133	*82*	39	12	36	40	7	36	34	46	18	134		
Tough	41	5	14	5	9	6	17	29	22	74	*80*	22	2	6	2	8	5	10	12	13	40		
Towie	20	5	33	14	0	20	20	21	11	72	*80*	22	2	22	11	0	14	24	10	9	57		
Turriff	90	24	222	107	2	26	157	174	88	445	*86*	108	29	228	104	7	31	155	180	110	476		
Tyrie	7	5	10	9	0	5	7	11	8	31	*84*	18	1	6	8	0	3	8	13	9	33		
Udny	7	2	27	7	0	1	20	15	7	43	*82*	18	2	19	6	0	0	20	15	10	45		
Ythan Wells ...	13	6	46	25	1	14	37	26	14	91	*82*	9	6	41	12	1	12	28	15	14	69		
Totals ...	**6426**	**1600**	**11189**	**6382**	**283**	**3844**	**7848**	**8682**	**5506**	**25880**	—	**6890**	**1322**	**9762**	**5972**	**271**	**3677**	**7293**	**7963**	**5284**	**24217**		

TABLE XV.—(*continued*).

County and Parish Data.

ARGYLL.

Parish	BOYS										District	GIRLS									
	Hair					Eyes				Totals		Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Acharacle	7	5	10	22	0	5	18	15	6	44	*100*	6	3	10	14	0	6	12	11	4	33
Ardchattan and Muckairn ...	16	2	18	10	3	4	10	17	18	49	*101*	21	4	16	15	0	7	17	19	13	56
Ardgour	14	3	17	19	1	7	21	11	15	54	*100*	18	3	6	23	1	11	14	13	13	51
Ardnamurchan	0	1	2	13	0	3	1	8	4	16	*100*	0	1	5	12	0	4	1	12	1	18
Campbeltown (Burgh) ...	223	53	393	269	10	178	262	311	197	948	*103*	229	43	352	265	26	135	298	284	198	915
„ (Landward) ...	43	4	49	34	5	24	21	55	35	135	*103*	51	6	55	30	1	40	21	51	31	143
Coll	15	4	21	10	0	5	18	26	1	50	*100*	9	3	18	10	0	5	15	16	4	40
Colonsay and Oronsay ...	0	0	16	8	0	6	15	2	1	24	*102*	2	0	6	8	0	3	10	1	2	16
Craignish	8	1	22	8	1	1	26	12	1	40	*101*	9	0	15	7	1	1	20	11	0	32
Cumlodden	21	3	16	12	1	6	26	3	18	53	*101*	12	2	5	13	0	3	16	9	4	32
Dunoon and Kilmun ...	143	41	306	198	11	92	188	269	150	699	*104*	147	28	283	163	13	71	190	218	155	634
Gigha and Cara	19	1	13	8	0	4	30	5	2	41	*102*	18	2	8	8	0	6	20	7	3	36
Glassary	33	3	21	22	0	30	15	22	12	79	*101*	26	4	18	25	2	19	21	23	12	75
Glenaray & Inveraray (Burgh)	8	0	6	1	2	9	0	3	5	17	*101*	8	0	1	2	2	8	0	3	2	13
Glenorchy and Inishail ...	10	3	21	13	0	2	22	14	9	47	*101*	11	4	16	22	0	11	16	16	10	53
Inverchaolain	0	1	4	4	0	2	2	2	3	9	*104*	5	0	3	4	0	2	5	2	3	12
Jura	4	1	16	17	0	2	13	17	6	38	*102*	9	1	20	13	0	8	15	13	7	43
Kilbrandon and Kilchattan	21	1	29	25	0	7	34	27	8	76	*101*	16	1	19	21	0	6	23	17	11	57
Kilcalmonell	15	2	12	24	1	7	26	1	20	54	*102*	10	3	13	16	0	6	18	6	12	42
Kilchoman	59	13	88	65	2	17	97	78	35	227	*102*	62	13	79	44	5	21	94	45	43	203
Kilchrenan and Dalavich ...	11	7	22	7	0	11	11	21	4	47	*101*	18	4	24	10	0	19	17	11	9	56
Kildalton	33	6	68	57	3	28	61	32	46	167	*102*	41	6	53	45	3	33	38	43	34	148
Kilfinan	38	4	69	42	1	20	84	33	17	154	*102*	42	7	53	42	1	27	69	33	16	145
Kilfinichen and Kilvickeon	41	7	38	53	4	27	58	31	27	143	*100*	28	3	25	49	2	19	39	25	24	107
Killarrow and Kilmeny ...	63	8	62	119	5	27	85	89	56	257	*102*	45	11	63	79	3	18	62	68	53	201
Killean and Kilchenzie ...	20	3	27	10	3	27	5	20	11	63	*103*	33	6	32	9	2	37	11	19	15	82
Kilmartin	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kilmodan	3	0	9	6	2	4	3	4	9	20	*104*	9	0	5	6	0	7	5	2	6	20
Kilmore and Kilbride ...	1	0	4	1	0	1	3	2	0	6	*101*	2	0	6	4	0	1	4	3	4	12
Kilninian and Kilmore ...	31	5	31	42	4	10	36	38	29	113	*100*	36	9	46	47	1	14	43	59	23	139
Kilninver and Kilmelford ...	4	1	9	1	1	6	4	5	1	16	*101*	2	0	1	3	2	2	0	5	1	8
Lismore and Appin	54	10	69	82	7	53	67	42	60	222	*101*	53	14	65	58	9	58	57	46	38	199
Lochgilphead	20	9	28	56	0	1	39	46	27	113	*101*	53	4	36	38	0	6	36	35	34	111
Lochgoilhead and Kilmorich	9	3	15	6	0	6	13	6	8	33	*101*	9	1	10	9	0	1	13	6	9	29
Morvern	18	1	17	8	0	15	10	16	3	44	*100*	19	5	12	13	1	10	12	18	10	50

Lismore and Appin	32	10	30	22	0	1	39	46	27	113	*101*	33	4	36	29	0	1	13	6	9	29	
Lochgilphead	20	9	28	56	0	1	39	46	27	113	*101*	33	4	36	29	0	1	13	6	9	29	
Lochgoilhead and Kilmorich	9	3	15	6	0	6	13	6	8	33	*101*	9	1	10	9	0	1	13	6	9	29	
Morvern	18	1	17	8	0	15	10	16	3	44	*100*	19	5	12	13	1	10	12	18	10	50	
North Knapdale	3	0	8	5	0	0	6	8	2	16	*102*	4	1	8	7	0	0	6	10	4	20	
Oban (Burgh)	61	24	173	129	0	3	160	158	66	387	*101*	66	16	170	98	0	1	134	150	65	350	
Saddell and Skipness ...	13	6	21	34	1	9	36	19	11	75	*102*	14	6	24	19	0	8	28	18	9	63	
Salen	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Small Isles	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Southend	29	5	21	12	0	0	22	39	6	67	*103*	19	2	11	10	1	0	16	16	11	43	
S. Knapdale	14	1	11	12	0	10	13	10	5	38	*102*	11	4	10	10	2	4	12	14	7	37	
Stralachlan and Strachur ...	5	1	5	1	2	2	5	6	1	14	*101*	8	1	10	4	0	4	9	7	3	23	
Strontian	9	2	22	11	2	3	24	3	16	46	*100*	11	4	13	6	2	5	21	7	3	36	
Tarbert	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Torosay	20	2	13	5	1	8	17	12	4	41	*100*	13	0	7	10	2	11	8	8	5	32	
Tyree	43	10	44	32	4	27	51	35	20	133	*100*	37	4	44	33	4	30	38	38	16	122	
Totals	1202	257	1866	1513	77	709	1658	1573	975	4915	—	1222	229	1676	1324	86	688	1504	1418	927	4537	

AYR.

Alloway	24	0	45	28	1	2	41	30	25	98	*31*	30	7	42	19	1	4	40	29	26	99	
Ardrossan	112	36	241	176	4	45	223	188	113	569	*29*	200	33	259	133	4	14	156	340	119	629	
Auchinleck	92	31	207	118	5	34	160	168	91	453	*26*	149	39	199	98	5	50	158	180	102	490	
Ayr (Burgh)	340	88	507	368	18	169	447	392	313	1321	*25*	332	59	511	333	6	177	425	364	275	1241	
Ballantrae	3	2	6	11	0	4	3	6	9	22	*32*	4	1	8	8	0	4	7	6	4	21	
Barr	1	2	2	2	0	0	3	2	2	7	*31*	1	1	1	1	0	0	0	1	3	4	
Beith	170	35	249	132	7	98	175	201	119	593	*30*	183	39	230	150	7	105	195	178	131	609	
Colmonell	34	7	70	51	2	39	34	61	30	164	*32*	47	13	62	47	1	41	29	64	36	170	
Coylton	67	13	79	67	4	71	59	43	57	230	*31*	86	16	67	36	5	78	57	26	49	210	
Crosshill	24	4	36	31	2	22	33	26	16	97	*31*	32	5	33	37	2	23	36	29	21	109	
Dailly	22	1	17	31	2	27	22	6	18	73	*31*	15	4	15	26	0	26	9	4	21	60	
Dalmellington	40	7	104	36	0	2	99	56	30	187	*31*	55	10	95	39	0	7	97	63	32	199	
Dalry	159	30	223	152	9	62	212	201	98	573	*30*	134	19	196	116	14	65	157	163	94	479	
Dalrymple	23	9	85	30	2	8	57	45	39	149	*31*	20	5	77	26	2	8	47	43	32	130	
Dreghorn	99	18	45	51	0	24	102	61	26	213	*28*	96	4	67	34	0	16	111	55	19	201	
Dundonald	123	24	274	157	11	93	148	207	141	589	*28*	118	23	248	125	11	94	152	158	121	525	
Dunlop	23	3	54	15	1	6	57	20	13	96	*30*	20	8	41	19	1	2	48	31	8	89	
Fenwick	19	3	24	5	0	0	41	10	0	51	*30*	14	0	23	3	0	0	25	15	0	40	
Galston	143	32	266	108	20	115	153	175	126	569	*28*	149	22	182	122	4	93	161	129	96	479	
Girvan (Town)	102	13	78	100	6	46	94	95	64	299	*31*	103	11	97	69	3	51	81	90	61	283	
„ (Landward)	23	9	105	62	1	20	38	89	53	200	*31*	21	13	86	65	4	15	36	87	51	189	
Irvine (Burgh)	170	39	242	174	7	95	205	163	169	632	*28*	181	20	257	174	8	109	186	180	165	640	
„ (Landward)	33	5	38	18	1	29	31	3	32	95	*28*	19	11	34	16	0	19	36	3	22	80	
Kilbirnie	213	26	227	120	2	119	210	140	119	588	*30*	183	34	212	162	3	109	215	147	123	594	
Kilmarnock (Burgh) ...	522	127	1002	522	21	309	754	672	459	2194	*27*	470	89	977	507	15	274	700	637	447	2058	
„ (Landward) ...	57	14	64	43	2	9	70	41	60	180	*28*	42	11	57	48	1	11	56	47	45	159	
Kilmaurs	170	18	215	78	1	5	218	170	89	482	*28*	136	31	177	85	1	14	174	139	103	430	
Kilwinning	137	32	302	134	2	79	225	184	119	607	*30*	154	32	261	91	3	62	193	185	101	541	
Kirkmichael	21	2	9	6	0	9	12	12	5	38	*31*	39	2	10	9	3	22	13	16	12	63	

TABLE XV.—(*continued*).

County and Parish Data.

AYR—(*continued*).

Parish	BOYS										District	GIRLS									
	Hair					Eyes				Totals		Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Kirkoswald	12	2	26	5	1	0	14	20	12	46	*31*	14	1	17	11	0	3	14	15	11	43
Largs	17	1	26	8	2	5	12	29	8	54	*23*	22	1	20	11	2	7	13	26	10	56
Loudoun	132	20	162	90	16	190	96	69	65	420	*28*	173	23	140	105	9	179	103	74	94	450
Mauchline	61	4	183	64	1	27	85	135	66	313	*26*	79	4	161	62	0	29	103	114	60	306
Maybole & Maybole W. Church	140	33	307	243	5	64	160	307	197	728	*31*	138	27	264	177	6	60	135	261	156	612
Monkton and Prestwick ...	74	12	106	24	2	19	44	106	49	218	*26*	70	12	92	34	4	25	53	96	38	212
Muirkirk	30	4	49	47	2	10	29	51	42	132	*26*	39	5	48	37	3	26	34	39	33	132
New Cumnock	104	31	118	85	2	89	106	85	60	340	*36*	128	16	108	90	0	78	110	91	63	342
Ochiltree	38	6	65	51	0	15	45	56	44	160	*26*	38	7	49	42	3	12	35	48	44	139
Old Cumnock	144	36	159	128	4	126	111	145	89	471	*26*	166	23	146	119	3	96	129	146	86	457
Riccarton	117	22	145	118	10	52	134	160	66	412	*28*	135	18	134	118	1	70	113	162	61	406
St Quivox (Landward) and Newton on Ayr (Landward)	13	1	24	12	8	12	14	22	10	58	*26*	9	0	24	5	1	8	9	18	4	39
Sorn	109	11	105	46	1	54	86	88	44	272	*26*	94	19	81	51	1	42	73	77	54	246
Stair	36	3	33	18	1	13	39	21	18	91	*26*	47	8	34	18	3	26	39	29	16	110
Stevenston	247	45	351	212	7	259	191	203	209	862	*29*	244	33	349	202	20	249	192	212	195	848
Stewarton	112	14	99	42	1	137	34	55	42	268	*30*	123	15	97	49	3	146	36	45	60	287
Straiton	16	3	12	11	0	14	7	7	14	42	*31*	16	0	6	12	0	14	9	1	10	34
Symington	16	3	3	13	4	16	5	7	11	39	*26*	19	1	9	8	2	21	6	6	6	39
Tarbolton	60	4	95	39	2	82	42	32	44	200	*26*	60	10	90	23	1	95	32	29	28	184
West Kilbride	32	8	93	34	3	23	58	60	29	170	*23*	40	10	90	65	5	29	73	62	46	210
Totals	4476	893	6977	4116	203	2748	5238	5125	3554	16665	—	4687	795	6483	3837	171	2708	4911	4960	3394	15973
BANFF.																					
Aberlour	71	21	86	77	9	84	64	43	73	264	*90*	84	27	75	66	4	70	63	62	61	256
Alvah	15	5	34	11	0	23	10	17	15	65	*86*	20	7	26	13	1	23	12	19	13	67
Banff (Burgh)	81	20	218	68	3	79	93	135	83	390	*85*	92	31	185	84	2	77	83	155	79	394
„ (Landward) and Ord ...	22	3	25	26	2	10	36	23	9	78	*85*	26	5	30	26	1	12	28	26	22	88
Bellie	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Boharm	23	4	42	18	1	15	32	26	15	88	*90*	26	8	33	24	1	17	21	29	25	92
Botriphnie	28	2	24	7	0	7	23	24	7	61	*87*	26	4	19	9	0	2	29	13	14	58

Boharm	23	4	42	18	1	15	32	26	10	83	87	26	4	19	9	0	2	29	13	14	58	
Botriphnie	28	2	24	7	0	7	23	24	7	61	87											
Boyndie	49	4	112	35	0	22	60	86	32	200	85	57	9	110	25	1	16	84	67	35	202	
Cabrach	23	5	18	14	0	15	14	23	8	60	87	24	3	15	10	0	17	8	16	11	52	
Cullen	18	17	95	68	1	22	19	108	50	199	85	21	17	121	24	0	13	36	97	37	183	
Deskford	11	2	28	15	1	10	9	25	13	57	86	10	4	20	11	1	6	13	13	14	46	
Enzie	62	17	89	35	2	11	71	88	35	205	87	82	10	85	31	0	16	77	88	27	208	
Fordyce	135	18	181	125	2	64	129	162	106	461	85	131	23	170	125	9	44	120	174	120	458	
Gamrie	133	28	155	79	0	2	135	156	102	395	85	139	25	174	102	0	5	149	139	147	440	
Glenrinnes	3	2	14	9	0	13	10	2	3	28	90	12	3	9	11	2	11	15	6	5	37	
Grange	15	3	13	8	0	7	13	10	9	39	87	13	2	12	10	1	6	10	15	7	38	
Inveravon	51	15	53	74	9	46	54	58	44	202	91	59	11	47	55	6	43	54	35	46	178	
Inverkeithny	12	7	19	21	1	4	25	17	14	60	87	22	6	21	7	0	6	24	11	15	56	
Keith	105	29	125	86	2	52	79	115	101	347	87	137	28	157	92	6	70	121	130	99	420	
Kirkmichael	6	0	4	8	2	0	5	10	5	20	91	5	2	5	4	1	0	6	8	3	17	
Marnoch	77	17	87	54	4	57	40	74	68	239	86	111	19	76	66	4	78	50	88	60	276	
Mortlach	76	19	103	43	3	49	92	48	55	244	90	85	21	105	38	3	60	66	69	57	252	
Ordiquhill	12	7	39	19	4	26	23	13	19	81	86	21	4	34	22	1	28	25	16	13	82	
Rathven (and Buckie) ...	193	76	415	198	9	105	266	299	221	891	85	262	60	349	211	2	109	272	294	209	884	
Rothiemay	29	4	68	49	0	11	33	64	42	150	87	34	7	66	37	0	32	32	52	28	144	
Totals	1250	325	2047	1147	55	734	1335	1626	1129	4824	—	1499	336	1944	1103	46	761	1398	1622	1147	4928	

BERWICK.

Abbey St Bathan's	5	1	5	12	0	0	8	7	8	23	42	8	1	4	11	0	0	10	5	9	24	
Ayton	22	2	10	13	1	2	13	20	13	48	42	19	0	12	7	1	5	14	9	11	39	
Bunkle and Preston ...	4	0	7	4	0	3	2	9	1	15	42	11	0	6	2	0	6	5	6	2	19	
Channelkirk	10	1	23	6	0	5	6	21	8	40	42	10	3	11	8	0	3	1	20	5	32	
Chirnside	32	2	64	16	0	4	58	37	15	114	42	27	5	46	27	0	0	48	45	12	105	
Cockburnspath	3	0	6	9	0	4	7	3	4	18	42	4	0	4	3	0	3	4	1	3	11	
Coldingham	89	14	71	44	2	61	70	61	28	220	42	93	7	69	44	0	50	72	61	30	213	
Coldstream	54	2	64	43	2	16	51	55	43	165	42	34	5	51	28	0	10	38	45	25	118	
Cranshaws	0	0	2	9	0	0	6	4	1	11	42	0	0	6	3	0	0	4	4	1	9	
Duns	9	4	22	9	0	6	18	14	6	44	42	5	3	16	7	0	4	9	6	12	31	
Earlston	2	0	0	2	1	1	1	0	3	5	42	3	0	2	1	0	1	2	0	3	6	
Eccles	17	5	15	4	0	17	6	16	2	41	42	14	5	25	10	0	23	10	9	12	54	
Edrom	10	2	19	12	0	8	9	8	18	43	42	10	0	15	4	0	3	10	6	10	29	
Fouiden	12	0	13	6	0	10	7	9	5	31	42	9	0	5	8	0	4	14	2	2	22	
Gordon	17	3	29	21	0	8	30	19	13	70	42	27	3	18	11	0	11	17	19	12	59	
Hume and Stitchell ...	16	3	26	8	0	7	25	15	6	53	42	18	1	17	7	2	5	22	9	9	45	
Hutton	23	9	21	13	2	15	21	14	18	68	42	31	2	14	12	2	17	20	13	11	61	
Ladykirk	8	1	7	5	0	0	14	5	2	21	42	9	4	8	8	0	1	16	12	0	29	
Langton	8	1	15	4	0	7	14	0	7	28	42	8	3	7	3	0	5	12	0	4	21	
Lauder	43	3	29	19	0	11	38	24	21	94	42	25	6	26	12	1	3	32	20	15	70	
Legerwood	10	2	6	9	2	8	15	4	2	29	42	11	2	16	10	0	7	15	11	6	39	
Longformacus	4	0	6	1	0	5	2	3	1	11	42	7	0	4	1	0	8	0	3	1	12	
Mertoun	9	4	15	12	4	4	13	17	10	44	39	7	2	10	12	0	3	5	11	12	31	

TABLE XV.—(*continued*).

County and Parish Data.

BERWICK—(*continued*).

Parish	BOYS Hair					BOYS Eyes				BOYS Totals	District	GIRLS Hair					GIRLS Eyes				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Mordington	6	3	3	4	0	6	1	4	5	16	*42*	7	4	8	5	0	10	2	6	6	24
Nenthorn	3	1	15	5	0	4	10	5	5	24	*42*	0	2	9	12	0	4	4	9	6	23
Polwarth	3	1	6	12	3	0	6	12	7	25	*42*	3	1	9	2	0	1	6	7	1	15
Swinton	13	1	25	33	2	8	19	26	21	74	*42*	18	3	32	17	2	7	19	26	20	72
Westruther	16	6	8	20	2	14	11	14	13	52	*42*	18	2	9	8	2	9	15	7	8	39
Whitsome	14	1	22	7	1	4	19	9	13	45	*42*	14	2	18	20	2	8	13	15	20	56
Totals	462	72	554	362	22	238	500	435	299	1472	—	450	66	477	303	12	211	442	387	268	1308
BUTE.																					
Cumbrae	22	7	49	22	2	9	36	29	28	102	*104*	25	10	47	13	0	9	34	25	27	95
Kilbride	18	1	61	47	0	13	21	68	25	127	*103*	30	2	69	40	1	14	33	61	34	142
Kilmory	10	1	39	32	4	12	40	16	18	86	*103*	25	0	16	21	1	6	35	8	14	63
Kingarth	17	7	34	28	5	6	40	26	19	91	*104*	12	5	26	22	2	5	35	13	14	67
North Bute	10	9	49	30	3	18	27	35	21	101	*104*	14	1	26	28	1	10	18	25	17	70
Rothesay (Burgh) ...	156	46	335	153	11	66	243	238	154	701	*104*	200	46	281	206	10	96	242	269	136	743
Totals	233	71	567	312	25	124	407	412	265	1208	—	306	64	465	330	15	140	397	401	242	1180
CAITHNESS.																					
Bower	15	2	49	33	1	27	13	39	21	100	*98*	39	4	50	15	3	39	26	28	18	111
Canisbay	37	7	62	35	2	24	36	59	24	143	*97*	57	8	53	30	2	16	54	47	33	150
Dunnet	31	9	48	11	0	19	25	40	15	99	*98*	27	3	42	11	0	17	19	31	16	83
Halkirk	47	9	54	36	6	35	44	40	33	152	*98*	64	4	43	33	3	24	39	46	38	147
Keiss...	7	7	15	9	0	6	10	13	9	38	*97*	11	3	7	2	0	11	3	4	5	23
Latheron	84	11	79	58	1	23	93	68	49	233	*97*	75	8	65	48	3	22	76	66	35	199
Olrig	38	6	61	58	2	36	49	34	46	165	*98*										

Dunnet	47	9	54	36	6	35	44	40	33	152	*98*	64	4	45	2	0	11	3	4	5	23
Halkirk	7	7	15	9	0	6	10	13	9	38	*97*	11	3	7	2	0	3	1	1	1	7
Keiss...	84	11	79	58	1	23	93	68	49	233	*97*	75	8	65	48	3	22	76	66	35	199
Latheron																					
Olrig	38	6	61	58	2	36	49	34	46	165	*98*	41	8	64	25	1	23	46	38	32	139
Reay	8	5	30	6	1	3	3	32	12	50	*98*	9	1	18	6	0	2	9	14	9	34
Thurso	54	27	266	126	2	30	175	149	121	475	*98*	59	24	264	142	2	37	174	147	133	491
Watten	29	7	28	20	3	5	36	28	18	87	*98*	40	2	13	29	3	4	28	22	33	87
Wick (Burgh)... ...	279	67	394	305	46	116	244	430	301	1091	*97*	262	44	330	263	30	111	252	329	237	929
Wick (Landward) ...	82	12	55	47	4	37	77	44	42	200	*97*	60	8	47	43	3	51	49	26	35	161
Totals	711	169	1141	744	68	361	805	976	691	2833	—	744	117	996	647	50	357	775	798	624	2554

CLACKMANNAN.

Alloa (Town)... ...	236	44	435	188	0	56	339	331	177	903	*51*	243	36	401	182	1	64	350	291	158	863
„ (Landward) ...	59	6	54	31	0	72	35	15	28	150	*51*	56	0	45	19	1	53	35	12	21	121
Alva	25	6	34	9	1	36	4	27	8	75	*51*	11	2	4	2	1	12	0	5	3	20
Clackmannan	38	2	117	77	2	25	60	87	64	236	*51*	64	6	79	60	1	25	48	77	60	210
Dollar...	32	4	43	26	1	23	47	16	20	106	*51*	16	6	30	29	0	16	22	28	15	81
Tillicoultry	103	25	161	138	2	33	142	163	91	429	*51*	95	17	147	102	0	25	106	142	88	361
Totals	493	87	844	469	6	245	627	639	388	1899	—	485	67	706	394	4	195	561	555	345	1656

DUMBARTON.

Arrochar	6	1	17	5	0	1	8	15	5	29	*101*	4	1	18	12	0	0	6	20	9	35
Bonhill	344	48	401	320	16	188	381	273	287	1129	*105*	342	35	363	370	16	172	389	306	259	1126
Cardross	105	29	198	123	6	53	163	177	68	461	*105*	87	16	157	89	1	30	115	118	87	350
Cumbernauld	42	12	136	61	3	25	99	64	66	254	*10*	38	12	107	62	1	15	85	67	53	220
Dumbarton (Burgh) ...	288	35	433	226	10	86	323	379	204	992	*106*	294	29	388	213	3	68	330	328	201	927
Kilmaronock ...	18	0	13	10	1	18	5	16	3	42	*105*	20	0	5	21	1	20	7	16	4	47
Kirkintilloch (Town)...	95	27	141	106	3	66	127	109	70	372	*12*	98	29	128	106	11	78	124	101	69	372
„ (Land.)...	79	11	77	55	6	23	109	56	40	228	*12*	74	19	86	44	11	27	95	55	57	234
Luss	13	1	17	15	0	2	13	19	12	46	*105*	12	1	15	10	2	7	19	8	6	40
New or E. Kilpatrick...	65	21	158	51	0	21	116	110	48	295	*19*	70	19	158	63	0	41	129	97	43	310
Old or W. Kilpatrick...	157	32	311	190	17	105	204	220	178	707	*22*	184	32	290	169	9	87	227	202	168	684
Roseneath	15	0	15	20	2	4	29	16	3	52	*105*	11	1	7	15	1	6	18	10	1	35
Row	181	33	271	156	13	147	159	161	187	654	*105*	188	20	218	152	13	128	185	142	136	591
Totals	1408	250	2188	1338	77	739	1736	1615	1171	5261	—	1422	214	1940	1326	69	679	1729	1470	1093	4971

TABLE XV.—(*continued*).

County and Parish Data.

DUMFRIES.

Parish	BOYS Hair					BOYS Eyes				BOYS Totals	District	GIRLS Hair					GIRLS Eyes				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Annan	174	23	264	163	4	123	120	236	149	628	*37*	175	30	236	118	7	111	128	188	139	566
Applegarth & Sibbaldbie	7	2	35	15	0	10	12	17	20	59	*37*	17	1	13	7	0	8	9	15	6	38
Brydekirk	15	0	20	15	0	17	9	15	9	50	*37*	26	3	34	26	2	23	27	18	23	91
Canonbie	32	3	16	22	0	13	26	21	13	73	*37*	38	4	20	17	1	13	33	18	16	80
Caerlaverock	10	5	9	8	0	6	11	12	3	32	*37*	8	1	9	9	1	8	6	8	6	28
Closeburn	25	8	64	36	0	8	66	29	30	133	*36*	49	9	64	40	0	17	53	55	37	162
Cummertrees	9	1	7	7	0	0	7	3	14	24	*35*	9	0	6	5	1	4	5	0	12	21
Dalton	10	2	17	9	0	7	12	9	10	38	*37*	15	1	15	5	0	11	12	9	4	36
Dornock	19	2	32	21	0	25	10	10	29	74	*37*	16	4	37	19	0	18	14	15	29	76
Dryfesdale	78	18	172	44	1	57	116	95	45	313	*37*	62	17	189	56	4	62	102	108	56	328
Dumfries (Burgh) ...	253	54	524	221	9	73	375	418	195	1061	*35*	214	30	371	207	7	69	308	281	171	829
,, (Landward)	101	23	169	98	4	63	134	117	81	395	*35*	115	23	157	97	1	59	129	128	77	393
Dunscore	24	3	19	34	8	15	35	20	18	88	*36*	17	2	26	24	10	15	21	31	12	79
Durrisdeer	22	0	14	25	2	8	24	16	15	63	*36*	37	3	29	17	1	11	39	25	12	87
Eskdalemuir	4	1	4	3	0	0	2	8	2	12	*37*	6	2	7	4	0	0	8	7	4	19
Ewes	3	5	12	0	0	0	13	7	0	20	*37*	2	1	7	1	0	0	5	3	3	11
Glencairn	27	5	30	29	1	15	47	16	14	92	*36*	50	2	27	16	1	15	46	21	14	96
Gretna	32	5	29	32	0	2	25	43	28	98	*37*	44	7	31	25	2	3	40	41	25	109
Hoddam	26	5	57	28	0	6	60	31	19	116	*37*	48	2	32	23	1	16	53	15	22	106
Holywood	36	5	51	23	1	4	26	69	17	116	*36*	32	5	23	12	2	1	14	41	18	74
Hutton and Corrie ...	13	3	57	8	0	22	27	23	9	81	*37*	10	3	45	9	0	12	26	24	5	67
Johnstone	20	4	34	10	0	0	35	21	12	68	*37*	26	9	28	7	1	1	38	22	10	71
Keir	10	2	23	5	1	12	14	6	9	41	*36*	8	4	15	4	0	3	17	6	5	31
Kirkconnel	1	1	1	0	1	0	2	2	0	4	*36*	4	0	4	3	1	1	3	3	5	12
Kirkmahoe	10	0	10	10	0	2	16	7	5	30	*36*	5	0	9	7	0	5	6	8	2	21
Kirkmichael	13	1	29	16	1	7	24	22	7	60	*37*	17	5	17	19	2	5	20	18	17	60
Kirkpatrick Fleming ...	38	3	72	40	0	10	40	78	25	153	*37*	31	3	44	33	2	7	33	49	24	113
,, Juxta ...	17	4	27	11	1	21	16	10	13	60	*37*	36	5	17	9	1	18	24	8	18	68
Langholm	74	15	149	65	2	26	97	100	82	305	*37*	93	9	98	69	3	27	78	99	68	272
Lochmaben	96	6	88	45	0	38	76	89	32	235	*37*	113	6	75	43	0	32	76	104	25	237
Middlebie	40	6	51	32	1	17	39	47	27	130	*37*	46	8	45	42	0	23	29	56	33	141
Moffat	47	6	140	62	1	49	57	108	42	256	*37*	57	9	117	50	2	50	53	83	49	235
Morton	29	6	27	15	0	4	26	28	19	77	*36*	34	7	24	17	0	4	19	37	22	82
Mouswald	9	1	5	9	2	4	7	11	4	26	*35*	10	1	3	8	1	3	12	7	1	23
Penpont	13	4	37	10	0	9	27	23	5	64	*36*	14	6	34	10	1	7	21	31	6	65

Moffat	47	6	146	82	1	10	33	39	23	106	36	47	8	24	17	0	4	15	37	22	78	
Morton	29	6	27	15	0	4	26	28	19	77	35	10	1	3	8	1	3	12	7	1	23	
Mouswald	9	1	5	9	2	4	7	11	4	26	35	10	1	3	8	1	3	12	7	1	23	
Penpont	13	4	37	10	0	9	27	23	5	64	36	14	6	34	10	1	7	21	31	6	65	
St Mungo	15	6	9	12	0	27	4	2	9	42	37	22	1	17	11	0	24	7	6	14	51	
Sanquhar	65	10	118	71	0	7	94	89	74	264	36	62	13	92	62	4	5	91	87	50	233	
Tinwald	22	4	13	19	0	4	20	24	10	58	37	16	5	14	29	1	10	25	17	13	65	
Torthorwald	39	4	13	35	1	16	28	40	8	92	35	29	7	15	33	3	10	20	36	21	87	
Tundergarth	12	1	18	15	0	0	26	3	17	46	37	17	1	19	13	0	0	30	7	13	50	
Tynron	4	3	14	5	0	6	6	10	4	26	36	16	0	11	2	0	5	8	12	4	29	
Wamphray	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Westerkirk	9	2	22	8	2	12	15	6	10	43	37	12	2	9	9	0	5	14	3	10	32	
Totals	1503	262	2502	1336	43	745	1826	1941	1134	5646	—	1658	251	2085	1217	63	721	1702	1750	1101	5274	

EDINBURGH.

Borthwick	34	2	16	11	2	18	16	21	10	65	47	31	8	19	7	1	21	23	12	10	66	
Carrington	10	0	3	7	0	2	10	0	8	20	47	9	3	5	6	1	3	12	0	9	24	
Cockpen	28	9	82	49	2	19	65	56	30	170	47	45	8	62	30	2	17	53	56	21	147	
Coliuton	84	21	184	78	3	75	124	106	65	370	46	85	18	147	75	3	60	79	116	73	328	
Corstorphine	65	12	65	52	2	28	57	76	35	196	46	43	10	59	38	2	7	62	53	30	152	
Cramond	32	10	64	44	4	18	54	47	35	154	46	47	8	60	18	2	14	65	26	30	135	
Cranston	40	3	40	22	1	31	32	31	12	106	47	46	2	36	13	0	16	38	34	9	97	
Crichton	14	1	57	21	1	19	31	31	13	94	47	23	0	41	20	3	22	28	19	18	87	
Currie	45	11	83	42	1	15	53	72	42	182	46	51	9	72	36	0	20	45	57	46	168	
Dalkeith (Town) ...	61	18	160	75	2	27	139	89	61	316	47	85	17	140	56	1	15	125	101	58	299	
Edinburgh City ...	2584	529	4220	2388	98	1484	2927	2992	2416	9819	44	2593	485	4008	2518	139	1437	2908	2996	2402	9743	
Fala and Soutra ...	8	1	22	3	0	0	15	18	1	34	47	14	2	11	8	0	0	13	17	5	35	
Glencorse	28	5	57	17	0	27	35	22	23	107	47	45	6	49	32	0	32	36	23	41	132	
Heriot	5	3	13	11	0	2	0	18	12	32	47	8	0	15	11	0	0	0	18	16	34	
Inveresk (Landward)	35	8	28	20	0	16	29	26	20	91	46	32	10	23	13	0	14	24	25	15	78	
Kirknewton & E. Calder	65	16	95	82	6	13	84	99	68	264	47	91	12	125	61	2	34	89	111	57	291	
Lasswade	244	41	437	181	6	221	212	282	194	909	47	270	66	395	164	7	183	243	283	193	902	
Leith Burgh	1365	343	2630	1411	42	611	1888	1978	1314	5791	45	1602	289	2443	1448	36	642	1913	2009	1254	5818	
Liberton	117	23	168	82	8	74	93	120	111	398	46	110	22	150	61	1	66	89	102	87	344	
Mid-Calder	25	2	18	27	0	5	33	17	17	72	47	24	3	25	17	0	5	23	23	18	69	
Musselburgh	219	42	361	185	3	127	284	229	170	810	46	275	50	385	219	4	142	280	325	186	933	
Newbattle	2	2	17	10	0	13	4	6	8	31	47	7	1	11	3	0	7	1	7	7	22	
Penicuik	54	14	109	57	1	26	44	94	71	235	47	59	13	95	48	2	21	62	89	45	217	
Ratho	46	10	71	28	1	25	49	57	25	156	46	41	11	44	33	2	25	50	32	24	131	
Stobhill	116	28	144	60	3	78	103	104	66	351	47	101	19	158	57	4	81	85	101	72	339	
Temple	20	3	19	17	0	29	5	7	18	59	47	23	4	12	8	0	23	5	12	7	47	
West Calder	41	12	54	45	0	41	30	44	37	152	47	62	8	66	33	0	50	47	40	32	169	
Totals	5387	1169	9217	5025	186	3044	6416	6642	4882	20984	—	5822	1084	8656	5033	212	2957	6398	6687	4765	20807	

TABLE XV.—(*continued*). *County and Parish Data.*

ELGIN.

Parish	BOYS Hair					BOYS Eyes				BOYS Totals	District	GIRLS Hair					GIRLS Eyes				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Alves	11	3	49	15	0	4	20	45	9	78	*89*	13	2	63	9	1	7	19	54	8	88
Bellie	33	14	118	53	2	55	51	63	51	220	*88*	36	18	92	46	1	50	27	63	53	193
Birnie	7	2	1	27	1	5	5	24	4	38	*90*	23	3	4	19	3	6	13	25	8	52
Cromdale	14	9	42	19	1	24	26	17	18	85	*91*	22	7	23	25	1	18	24	21	15	78
Dallas	4	4	5	5	1	1	3	6	9	19	*90*	3	2	11	2	0	2	6	4	6	18
Drainie	90	15	158	79	2	70	100	84	90	344	*88*	74	15	114	75	6	52	80	88	64	284
Duffus	80	17	134	60	5	52	65	112	67	296	*89*	74	4	108	57	2	28	69	91	57	245
Dyke	21	6	40	14	1	2	24	38	18	82	*89*	24	4	34	22	0	2	29	35	18	84
Edinkillie	12	6	32	27	2	15	23	27	14	79	*90*	17	3	16	19	1	7	16	24	9	56
Elgin (Burgh)	234	23	146	116	3	168	107	120	127	522	*88*	220	24	161	144	8	144	110	159	144	557
Elgin (Landward) ...	63	8	50	58	7	50	50	56	30	186	*88*	72	8	61	41	8	53	35	58	44	190
Forres (Burgh) ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kinloss	41	10	34	23	0	16	36	37	19	108	*89*	33	8	29	28	0	9	25	24	40	98
Knockando	13	5	65	27	0	34	25	33	18	110	*90*	34	9	72	46	0	34	51	56	20	161
New Spynie	8	6	17	6	1	2	11	12	13	38	*88*	6	1	10	3	0	1	8	8	3	20
Rafford	4	2	10	8	1	5	7	5	8	25	*90*	10	3	9	3	0	6	16	1	2	25
Rothes	75	12	78	47	5	44	61	71	41	217	*90*	74	10	82	40	7	50	49	64	50	213
St Andrews Lhanbryde	42	6	16	34	2	1	36	30	33	100	*88*	39	3	26	19	3	1	33	28	28	90
Speymouth	44	10	56	23	1	19	56	43	16	134	*88*	41	7	57	23	0	20	66	29	13	128
Urquhart	23	2	17	9	0	6	16	13	16	51	*88*	21	3	19	13	0	15	15	9	17	56
Totals	819	160	1068	650	35	573	722	836	601	2732	—	836	134	991	634	41	505	691	841	599	2636

FIFE.

Abdie	0	0	18	4	0	0	10	1	11	22	*55*	0	1	19	2	0	0	17	1	4	22
Aberdour	55	11	59	18	3	18	55	40	33	146	*53*	46	10	54	31	1	20	46	44	32	142
Anstruther (Easter) ...	15	10	57	42	9	18	40	40	35	133	*54*	13	7	57	53	2	16	41	31	44	132
Anstruther (Wester) ...	8	2	14	4	0	3	9	13	3	28	*55*	9	2	8	7	0	8	5	3	10	26
Auchterderran ...	124	29	230	102	0	44	176	201	64	485	*53*	144	20	195	94	2	36	144	206	69	455
Auchtermuchty ...	4	0	7	0	2	3	1	6	3	13	*57*	10	1	4	0	3	3	4	9	2	18
Auchtertool	9	5	28	20	0	2	20	29	11	62	*53*	17	6	21	22	0	0	26	26	14	66
Ballingry	44	8	78	66	3	6	64	66	63	199	*57*	30	10	66	54	0	9	44	53	54	160
Balmerino	12	1	30	10	0	14	11	16	12	53	*55*	11	4	10	10	0	6	13	6	10	35
Beath	495	109	895	481	25	324	526	725	430	2005	*57*	480	82	686	518	7	309	439	629	396	1773
Burntisland (Burgh & Landward)	42	1	42	26	0	9	52	19	31	111	*53*	53	14	45	33	2	16	73	30	28	147
Cameron	19	5	35	15	0	16	15	27	16	74	*55*	30	1	23	22	0	19	18	22	17	76
Carnbee	15	3	36	14	6	11	22	17	24	74	*55*	15	3	21	13	2	10	13	15	17	

Balmerino	12	1	30	13	0	9	13	19	12	56	*57*	480	82	686	518	7	369	135	326	214	1044
Beath	495	109	895	481	25	324	526	725	430	2005	*57*	480	82	686	518	7	369	135	326	214	1044
Burntisland (Burgh & Landward)	42	1	42	26	0	9	52	19	31	111	*53*	53	14	45	33	2	16	73	30	28	147
Cameron	19	5	35	15	0	16	15	27	16	74	*55*	30	1	23	22	0	19	18	22	17	76
Carnbee	15	3	36	14	6	11	22	17	24	74	*55*	15	3	21	13	2	10	12	15	17	54
Carnock	8	1	17	9	2	6	12	10	9	37	*52*	10	0	15	3	0	2	15	7	4	28
Collessie	44	13	99	46	1	19	35	112	37	203	*57*	35	5	66	38	1	19	31	70	25	145
Crail	25	3	83	28	0	1	40	72	26	139	*55*	26	3	64	19	0	2	33	53	24	112
Culross	18	5	23	17	0	1	30	11	21	63	*52*	37	3	9	16	0	2	30	15	18	65
Cults	14	4	15	36	3	9	24	24	15	72	*55*	11	0	21	28	2	6	18	22	16	62
Cupar (Landward) ...	4	2	1	1	0	0	3	2	3	8	*55*	5	2	4	2	0	0	6	3	4	13
Dairsie	29	3	12	11	4	11	9	20	19	59	*55*	20	5	10	13	3	5	15	12	19	51
Dalgety	13	1	13	14	0	11	10	11	9	41	*53*	15	1	20	5	0	18	2	4	17	41
Dunbog	9	1	15	4	0	0	4	18	7	29	*55*	10	4	12	8	1	0	7	17	11	35
Dunfermline (Burgh) ...	242	34	371	248	6	133	296	282	190	901	*52*	266	34	319	208	3	146	227	266	191	830
„ (Landward)	238	29	232	182	11	117	200	189	186	692	*52*	288	18	242	150	8	151	200	168	187	706
Dunino	10	0	13	9	0	3	14	12	3	32	*55*	8	1	12	9	2	1	9	15	7	32
Dysart (Burgh) ...	69	15	119	51	8	60	58	84	60	262	*54*	92	15	117	51	8	54	83	88	58	283
Elie	23	5	23	17	0	0	31	26	11	68	*55*	20	3	21	10	0	0	25	20	9	54
Falkland	28	15	73	42	1	9	39	62	49	159	*57*	41	10	44	57	0	9	36	58	49	152
Flisk	9	2	9	11	0	1	17	9	4	31	*55*	8	0	9	13	0	0	12	10	8	30
Forgan	43	3	46	33	1	20	46	42	18	126	*55*	48	4	50	30	7	25	46	42	26	139
Inverkeithing	68	14	174	78	4	20	124	116	78	338	*53*	102	18	137	97	2	13	118	141	84	356
Kennoway	32	11	69	32	0	27	48	48	21	144	*54*	46	7	58	35	0	30	35	40	41	146
Kettle	6	0	3	3	0	0	5	2	5	12	*57*	9	1	2	3	0	0	10	2	3	15
Kilconquhar	18	9	41	39	0	10	35	36	26	107	*55*	19	6	21	22	0	5	30	18	15	68
Kilmany	0	1	11	1	0	2	3	3	5	13	*56*	2	1	5	1	0	2	4	0	3	9
Kilrenny	100	9	130	66	3	73	72	94	69	308	*55*	126	13	147	68	0	90	79	97	88	354
Kinghorn	60	18	70	43	2	29	39	73	52	193	*53*	70	6	59	29	2	40	30	52	44	166
Kinglassie	29	4	34	28	1	27	27	21	21	96	*54*	30	2	29	22	0	21	12	25	25	83
Kingsbarns	31	2	23	14	0	18	28	14	10	70	*55*	30	0	14	14	0	11	18	18	11	58
Kirkcaldy (Burgh) ...	207	43	412	280	19	141	243	355	222	961	*50*	254	41	372	223	8	90	255	314	239	898
„ & Dysart (Land.)	23	5	27	57	1	1	56	32	24	113	*54*	28	8	34	30	1	6	54	28	13	101
Largo	60	10	54	22	3	25	40	62	22	149	*54*	74	7	41	29	1	21	33	64	34	152
Largoward	22	2	0	5	1	1	13	11	5	30	*55*	22	0	3	3	0	0	12	11	5	28
Leslie	42	24	241	48	0	11	99	178	67	355	*57*	80	10	211	88	0	17	68	211	93	389
Leuchars	51	11	109	55	2	7	83	77	61	228	*55*	83	9	71	51	2	10	79	79	48	216
Lochgelly	217	36	456	239	4	188	275	281	208	952	*53*	244	46	444	196	3	175	306	267	185	933
Markinch	103	24	256	92	6	93	112	153	123	481	*54*	113	18	213	95	1	81	116	143	100	440
Monimail	10	4	21	5	2	16	12	10	4	42	*56*	9	7	16	13	1	18	7	10	11	46
Moonzie	20	1	1	5	2	11	3	0	15	29	*56*	17	0	2	3	1	10	1	0	12	23
Newburgh	53	12	76	42	3	49	36	54	47	186	*55*	39	11	84	46	2	51	22	58	51	182
Newburn	9	1	1	0	1	4	6	1	1	12	*55*	72	3	1	5	3	8	1	7	3	19
Pittenweem	32	5	67	42	3	12	56	45	36	149	*55*	43	6	71	67	0	14	70	46	57	187
St Andrews (Burgh) ...	53	12	112	74	8	50	81	75	53	259	*55*	75	21	81	63	10	35	91	64	60	250
„ (Landward)	5	2	9	13	0	0	14	4	11	29	*55*	8	0	4	15	0	0	13	7	7	27
St Monance	69	16	82	32	5	36	62	39	67	204	*55*	81	20	60	40	3	25	61	51	67	204
Scoonie	5	0	19	8	0	10	10	5	7	32	*54*	5	3	24	6	0	9	6	16	7	38
Springfield	22	10	28	13	0	5	26	31	11	73	*57*	25	2	27	12	2	2	32	21	13	68
Strathmiglo	53	8	57	30	1	33	41	45	30	149	*57*	54	7	45	46	2	33	44	39	38	154
Wemyss	17	4	64	19	0	0	23	61	20	104	*54*	25	5	55	9	0	0	33	39	22	94
Totals	3085	618	5340	2946	156	1768	3541	4112	2724	12145	—	3518	547	4575	2850	98	1709	3317	3813	2749	11588

TABLE XV.—(*continued*).

County and Parish Data.

FORFAR.

Parish	BOYS										District	GIRLS									
	Hair					Eyes				Totals		Hair					Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Aberlemno	16	4	28	13	0	20	8	26	7	61	*73*	13	0	21	15	0	8	8	16	17	49
Airlie	13	2	17	2	0	7	0	21	6	34	*68*	19	3	23	1	0	11	0	23	12	46
Arbirlot	24	3	12	18	0	2	32	7	16	57	*65*	22	1	5	19	0	0	21	9	17	47
Auchterhouse	21	1	7	6	0	18	7	9	1	35	*68*	19	2	10	8	2	12	7	15	7	41
Arbroath (Burgh) ...	302	53	528	353	5	175	342	361	363	1241	*64*	280	63	505	372	14	138	360	370	366	1234
Barry	95	20	215	81	4	46	157	139	73	415	*65*	96	25	162	109	7	38	141	126	94	399
Brechin (Burgh) ...	83	23	245	103	1	63	143	150	99	455	*73*	74	29	213	84	2	62	125	127	88	402
„ (Landward) ...	30	6	27	21	0	25	27	14	18	84	*73*	35	2	22	19	0	19	31	13	15	78
Broughty Ferry (Burgh)	191	59	393	228	12	256	211	210	206	883	*65*	177	45	376	181	12	208	175	224	184	791
Careston	3	2	7	11	0	3	7	6	7	23	*73*	10	6	20	6	0	23	4	1	14	42
Carmyllie	47	5	47	23	1	22	39	34	28	123	*67*	45	8	31	20	1	32	31	30	12	105
Craig	30	10	30	8	2	19	18	25	18	80	*72*	35	4	34	11	0	25	12	30	17	84
Cortachy and Clovax ...	7	3	13	7	4	12	10	6	6	34	*75*	8	0	10	8	1	6	11	4	6	27
Dundee (Burgh) ...	2009	468	3925	2126	122	1258	2373	2929	2090	8650	*66*	2044	421	3540	2194	120	1168	2261	2855	2035	8319
„ (Landward) ...	29	8	39	26	0	12	36	21	33	102	*66*	40	3	20	35	0	10	34	25	29	98
Dunnichen	22	9	32	38	1	18	23	39	22	102	*67*	29	5	49	21	1	18	37	39	11	105
Eassie and Nevay ...	12	1	22	14	0	14	10	13	12	49	*68*	20	1	10	7	0	7	10	15	6	38
Edzell	34	5	47	16	1	24	27	26	26	103	*75*	28	7	13	19	0	16	13	20	18	67
Fern	9	1	7	11	0	0	16	12	0	28	*75*	9	0	8	11	0	0	10	16	2	28
Forfar (Burgh) ...	50	17	134	70	10	27	66	115	73	281	*67*	46	13	102	56	8	20	51	86	68	225
„ (Landward) ...	1	4	23	13	1	11	1	7	23	42	*67*	6	2	14	9	1	16	3	5	8	32
Fowlis Easter ...	8	0	2	13	1	0	4	11	9	24	*68*	13	3	2	14	0	1	12	11	8	32
Glamis	9	0	4	6	0	1	9	9	0	19	*67*	4	2	5	8	0	3	7	9	0	19
Glenisla	18	2	48	21	0	13	34	28	14	89	*76*	22	2	18	13	0	13	21	14	7	55
Guthrie	7	0	17	7	0	14	9	2	6	31	*73*	14	1	13	11	0	10	16	4	9	39
Inverarity	6	3	18	28	2	4	29	12	12	57	*67*	7	1	17	17	4	2	11	17	16	46
Inverkeilor	43	5	42	30	0	35	28	34	23	120	*65*	41	5	52	23	1	39	28	19	36	122
Kettins	9	3	30	10	0	18	2	20	12	52	*68*	7	2	18	16	0	16	4	11	12	43
Kinnell	14	2	18	26	0	8	21	16	15	60	*72*	13	2	19	8	0	7	10	5	20	42
Kinnettles	3	1	27	10	1	7	11	14	10	42	*67*	6	4	22	6	0	9	10	6	13	38
Kirkden	12	2	5	5	0	3	8	11	2	24	*67*	6	1	6	4	0	2	6	8	1	17
Kirriemuir	184	36	285	149	6	132	177	214	137	660	*75*	164	34	195	123	10	105	140	146	135	526
Liff, Benvie, etc. ...	34	11	52	25	0	20	46	33	23	122	*68*	34	7	51	26	0	18	49	32	19	118
Lintrathen	10	2	23	10	5	18	4	9	19	50	*76*	13	3	17	14	8	22	2	11	20	55
Lochlee	7	2	0	8	0	1	5	4	7	17	*75*	8	4	1	7	2	2	3	5	12	22
Logie Pert	8	3	29	5	0	1	21	16	7	45	*73*	20	5	18	3	0	2	23	13	8	46
Lunan	8	1	13	6	0	3	15	8	2	28	*72*	6	1	12	5	0	1	12	5	6	24
Lundie	11	2	7	8	0	2	2	12	12	28	*68*	14	3	4	7	0	4	0	17	7	28

Lochlee	7	2	6	5	0	1	21	16	7	45	73	20	5	18	3	0	2	23	13	8	46	
Logie Pert	8	3	29	5	0	1	21	16	7	45	73	20	5	18	3	0	2	23	13	8	46	
Lunan	8	1	13	6	0	3	15	8	2	28	72	6	1	12	5	0	1	12	5	6	24	
Lundie	11	2	7	8	0	2	2	12	12	28	68	14	3	4	7	0	4	0	17	7	28	
Mains & Strathmartine	36	9	57	26	4	37	32	31	32	132	68	44	5	58	17	3	34	35	29	29	127	
Maryton	8	1	12	12	0	2	10	7	14	33	72	4	2	12	5	0	2	8	3	10	23	
Menmuir	13	1	22	14	0	10	18	8	14	50	73	16	0	14	15	0	2	19	10	14	45	
Monifieth	34	9	102	54	4	14	43	102	44	203	65	34	13	85	40	1	10	47	79	37	173	
Monikie	34	9	45	39	1	17	44	43	24	128	67	42	8	41	50	1	26	45	26	45	142	
Montrose (Burgh) ...	173	30	252	126	3	107	162	183	132	584	72	156	14	211	92	7	68	158	144	110	480	
„ (Landward)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Murroes	66	1	3	14	0	4	42	30	8	84	67	51	3	2	15	0	2	33	18	18	71	
Navar and Lethnot ...	1	0	10	3	0	3	4	4	3	14	75	7	0	4	3	0	2	5	6	1	14	
Newtyle	10	5	40	18	0	15	18	21	19	73	68	9	2	42	14	1	11	22	17	18	68	
Oathlaw	8	1	23	9	0	17	2	16	6	41	75	14	2	10	9	0	15	1	13	6	35	
Panbride	26	11	96	22	2	4	89	35	29	157	65	28	4	75	11	0	3	59	25	31	118	
Rescobie	4	3	3	5	0	7	0	4	4	15	73	2	0	6	3	0	0	9	1	1	11	
St Vigeans & Arbroath (Landward)	22	7	51	36	0	23	16	43	34	116	65	28	1	54	25	0	24	14	41	29	108	
Tannadice	16	6	25	15	1	3	28	18	14	63	75	22	6	23	21	4	4	24	27	21	76	
Tealing	17	6	14	18	0	19	7	9	20	55	68	18	5	18	10	0	19	10	13	9	51	
Totals	3887	878	7173	3966	194	2594	4493	5177	3834	16098	—	3922	785	6313	3840	211	2315	4188	4834	3734	15071	

HADDINGTON.

Aberlady	11	3	47	13	0	17	26	21	10	74	43	17	1	33	19	0	7	28	17	18	70
Bolton	5	3	8	4	0	1	7	8	4	20	43	3	2	8	0	0	2	4	4	3	13
Dirleton	11	7	13	13	0	7	7	17	13	44	43	7	0	17	8	0	5	1	18	8	32
Dunbar (Burgh) ...	64	14	145	48	7	47	84	83	64	278	43	72	12	122	51	6	34	91	82	56	263
„ (Landward) ...	10	2	10	9	2	0	13	13	7	33	43	23	1	11	10	0	1	18	18	8	45
Garvald	8	1	6	19	0	3	17	8	6	34	43	14	6	7	17	0	2	32	5	5	44
Gladsmuir	18	5	39	22	2	39	19	13	15	86	43	20	3	31	29	0	30	18	19	16	83
Haddington (Burgh) ...	74	14	143	71	1	63	70	120	50	303	43	97	22	162	81	1	66	96	134	67	363
Innerwick	7	5	24	12	0	19	7	11	11	48	43	29	2	10	18	0	23	17	11	8	59
Morham	7	3	7	7	0	2	11	8	3	24	43	8	2	8	11	0	4	10	6	9	29
North Berwick ...	82	16	108	55	3	47	95	69	53	264	43	91	16	86	57	1	44	102	50	55	251
Ormiston	28	11	81	17	2	25	42	45	27	139	43	27	9	70	16	0	31	41	32	18	122
Pencaitland	9	3	25	19	4	7	23	19	11	60	43	24	2	16	16	0	9	22	18	9	58
Prestonpans	71	13	149	82	3	73	65	96	84	318	43	96	15	101	75	1	65	68	82	73	288
Salton	15	4	21	8	1	9	12	19	9	49	43	16	2	20	13	2	6	9	24	14	53
Spott	8	6	13	5	0	7	14	5	6	32	43	1	5	7	2	0	1	4	6	4	15
Stenton	14	2	16	11	0	6	10	23	4	43	43	18	0	19	18	1	5	14	24	13	56
Whitekirk & Tyninghame	38	6	18	16	2	1	42	24	13	80	43	27	3	11	15	2	1	28	20	9	58
Whittinghame ...	8	0	9	9	0	0	12	9	5	26	43	11	1	13	4	0	4	18	3	4	29
Yester	9	5	30	26	4	7	13	30	24	74	43	24	4	18	36	4	13	16	22	35	86
Totals	497	123	912	466	31	380	589	641	419	2029	—	625	108	770	496	18	353	637	595	432	2017

TABLE XV.—(*continued*). *County and Parish Data.*

INVERNESS.

Parish	BOYS HAIR					BOYS EYES				BOYS Totals	District	GIRLS HAIR					GIRLS EYES				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Abernethy and Kincardine	51	7	26	24	4	31	18	38	25	112	*91*	47	5	27	30	3	17	23	41	31	112
Alvie	11	4	15	13	1	7	12	13	12	44	*91*	18	2	10	19	2	10	13	13	15	51
Arisaig and Moidart ...	15	2	16	7	1	15	9	13	4	41	*100*	11	1	12	11	0	8	9	12	6	35
Barra	20	5	113	75	0	20	80	57	56	213	*107*	30	6	113	65	1	19	101	42	53	215
Boleskine & Abertarff	12	6	42	33	1	9	48	19	18	94	*94*	14	10	28	25	0	5	48	16	8	77
Bracadale	17	3	10	34	1	7	15	24	19	65	*99*	17	0	18	22	2	13	12	16	18	59
Croy and Dalcross ...	6	7	44	25	2	8	27	29	20	84	*89*	14	5	28	30	0	8	14	30	25	77
Daviot and Dunlichty	17	5	22	20	2	16	18	19	13	66	*91*	26	4	18	19	4	21	20	14	16	71
Dores	15	4	18	16	3	14	19	10	13	56	*94*	25	4	20	15	1	22	25	13	5	65
Duirinish	43	3	29	44	0	15	42	19	43	119	*99*	34	2	29	39	1	10	32	25	38	105
Duthil&Rothiemurchus	57	9	48	33	8	13	67	49	26	155	*91*	54	7	45	32	19	19	55	54	19	147
Glenelg	35	4	28	19	3	26	19	23	21	89	*99*	30	2	26	25	2	24	20	18	23	85
Glengarry	16	3	9	5	1	10	6	12	6	34	*100&94*	14	2	13	7	0	8	9	10	9	36
Harris	37	1	99	89	2	29	81	62	56	228	*108*	37	1	88	74	2	35	79	41	47	202
Insh	1	0	1	4	0	6	0	0	0	6	*91*	4	1	3	5	0	7	3	0	3	13
Inverness (Burgh) ...	311	80	555	358	25	192	350	510	277	1329	*92*	330	55	484	372	17	212	348	431	267	1258
" (Landward)	35	10	56	35	3	43	30	34	32	139	*92*	20	10	61	39	0	42	37	17	34	130
Kilmallie	71	17	98	86	10	47	96	72	67	282	*100*	59	15	69	61	11	28	79	58	50	215
Kilmonivaig	6	0	17	14	1	5	1	17	15	38	*100*	13	1	8	19	8	6	10	8	25	49
Kilmorack	29	10	53	35	2	27	49	20	33	129	*93*	32	6	59	31	7	23	63	24	25	135
Kilmuir	29	1	2	3	0	2	18	2	13	35	*99*	23	0	0	3	1	2	12	0	13	27
Kiltarlity	20	1	19	18	4	29	6	19	8	62	*94*	19	3	15	24	5	23	18	15	10	66
Kingussie	57	12	56	29	0	47	36	37	34	154	*91*	59	13	68	37	2	47	35	53	44	179
Kirkhill	28	2	21	12	1	19	23	13	9	64	*93*	29	2	15	17	2	15	24	19	7	65
Laggan	14	0	9	18	0	10	12	8	11	41	*91*	7	2	7	5	1	10	2	6	4	22
Moy and Dalarossie ...	19	1	25	12	1	17	24	7	10	58	*91*	26	3	22	12	2	24	21	6	14	65
North Uist	47	10	44	51	6	48	37	34	39	158	*107*	39	13	35	23	8	39	31	20	28	118
Petty	29	8	40	22	1	10	34	43	13	100	*89*	25	8	28	11	1	16	27	19	11	73
Portree	53	11	96	74	4	67	76	47	48	238	*99*	72	6	84	88	6	82	70	47	57	256
Sleat	23	2	44	31	4	11	37	36	20	104	*99*	23	1	18	29	1	11	24	19	18	72
Small Isles	5	1	10	7	0	2	4	14	3	23	*100*	13	1	8	3	4	4	5	9	11	29
Snizort	21	3	13	19	0	19	17	11	9	56	*99*	22	1	13	15	1	19	14	10	9	52
South Uist	78	2	62	37	1	37	56	66	21	180	*107*	35	12	57	34	3	41	36	37	27	141
Stenscholl	17	3	49	19	0	6	31	31	20	88	*99*	6	1	35	21	0	3	16	23	21	63
Strath	18	13	44	43	1	19	40	28	32	119	*99*	24	4	38	30	1	17	28	26	26	97
Urquhart&Glenmoriston	30	7	56	25	0	55	36	18	9	118	*94*	32	16	28	38	1	46	24	24	21	115
Totals	1293	257	1889	1389	93	938	1474	1454	1055	4921	—	1283	215	1630	1330	119	936	1387	1216	1038	4577

KINCARDINE.

Totals	1293	257	1889	1389	93	938	1474	1454	1055	4921	—	1283	215	1630	1330	113	956	1057	1215	1035	3477

KINCARDINE.

Arbuthnot	17	4	15	20	0	0	7	35	14	56	*74*	14	1	21	13	1	2	11	29	8	50
Banchory, Devenick ...	55	8	61	36	0	18	55	47	40	160	*74*	43	9	61	32	0	21	52	39	33	145
„ Ternan ...	52	20	112	73	0	61	72	67	57	257	*79*	60	11	58	54	3	36	55	51	44	186
Benholm	54	3	39	25	1	16	50	37	19	122	*72*	57	4	54	40	3	26	53	47	32	158
Bervie	48	14	113	71	0	21	112	49	64	246	*72*	81	14	111	51	5	54	96	32	80	262
Dunnottar	61	6	99	104	7	27	114	84	52	277	*74*	100	16	83	84	4	41	97	109	40	287
Durris	2	1	14	2	0	3	7	5	4	19	*79*	28	2	29	6	0	10	34	8	13	65
Fettercairn	23	3	41	36	3	12	32	40	22	106	*73*	27	3	43	27	1	19	52	17	13	101
Fetteresso & Rickarton	97	26	152	117	4	68	112	128	88	396	*74*	131	36	147	101	6	74	154	105	88	421
Fordoun	39	5	78	43	0	15	54	57	39	165	*75*	39	7	53	26	1	17	41	45	23	126
Garvock	9	0	6	8	0	0	10	7	6	23	*72*	4	0	8	4	0	0	8	4	4	16
Glenbervie	3	1	36	8	0	5	11	27	5	48	*75*	8	2	43	9	0	5	22	27	8	62
Kinneff & Catterline ...	17	7	25	30	2	11	26	27	17	81	*74*	31	2	24	13	2	8	17	33	14	72
Laurencekirk	65	17	95	29	6	22	83	63	44	212	*73*	65	13	72	35	7	22	65	60	45	192
Maryculter	19	11	38	11	1	21	22	19	18	80	*74*	28	6	21	8	0	24	5	21	13	63
Marykirk	19	3	17	23	0	14	12	26	10	62	*73*	23	3	8	18	1	16	12	16	9	53
Nigg	30	4	57	28	0	26	41	25	27	119	*74*	28	9	43	43	0	16	56	29	22	123
St Cyrus	20	7	26	65	2	2	35	62	21	120	*72*	18	7	33	66	1	3	29	70	23	125
Strachan	17	1	26	10	0	18	15	17	4	54	*79*	12	1	17	10	1	19	7	10	5	41
Totals	647	141	1050	739	26	360	870	822	551	2603	—	797	146	929	640	36	413	866	752	517	2548

KINROSS.

Cleish	13	0	6	8	0	4	8	7	8	27	*57*	10	2	13	10	0	5	4	9	17	35
Fossoway & Tulliebole	12	5	36	22	4	12	23	26	18	79	*57*	23	5	21	11	4	9	19	24	12	64
Kinross	46	12	109	47	1	22	64	86	43	215	*57*	70	6	92	50	1	21	84	76	38	219
Orwell	39	7	81	25	0	23	45	51	33	152	*57*	44	6	72	27	0	27	39	54	29	149
Portmoak	15	2	36	16	0	5	28	27	9	69	*57*	12	7	25	15	0	3	26	16	14	59
Totals	125	26	268	118	5	66	168	197	111	542	—	159	26	223	113	5	65	172	179	110	526

KIRKCUDBRIGHT.

Anworth	18	5	25	21	0	16	21	24	8	69	*34*	16	3	24	20	2	9	25	25	6	65
Balmaclellan	4	1	22	10	0	2	15	13	7	37	*34*	3	0	19	7	0	4	10	9	6	29
Balmaghie	19	4	20	20	0	1	28	21	13	63	*34*	15	2	23	17	0	2	26	18	11	57
Bargrennan	11	0	10	13	0	12	6	12	4	34	*34*	14	0	3	8	0	12	4	9	0	25
Borgue	19	9	54	32	0	36	22	31	25	114	*34*	26	3	36	20	2	21	25	27	14	87
Buittle	9	5	22	16	1	1	18	23	11	53	*34*	16	5	22	13	0	4	18	21	13	56

TABLE XV.—(*continued*).

County and Parish Data.

KIRKCUDBRIGHT.—(*continued*).

Parish	BOYS Hair					BOYS Eyes				BOYS Totals	District	GIRLS Hair					GIRLS Eyes				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Carsphairn	2	0	14	0	1	4	1	10	2	17	*36*	7	1	12	8	0	2	7	13	6	28
Colvend and Southwick	36	5	40	22	0	20	42	25	16	103	*34*	38	5	34	27	3	25	33	34	15	107
Corsock	2	2	5	10	1	3	4	8	5	20	*34*	3	1	9	6	0	3	2	8	6	19
Crossmichael	5	6	17	9	0	2	18	13	4	37	*34*	12	0	15	5	0	0	14	15	3	32
Dalry	3	0	56	13	0	2	36	23	11	72	*36*	12	2	47	12	0	2	36	18	17	73
Girthon	10	1	11	16	0	13	4	8	13	38	*34*	15	4	26	5	0	12	10	18	10	50
Irongray	4	1	7	1	0	4	6	2	1	13	*36*	3	1	5	4	0	2	2	4	5	13
Kells	21	6	27	32	0	18	25	19	24	86	*34*	22	4	27	23	2	14	26	13	25	78
Kelton	84	18	181	97	1	66	131	111	73	381	*34*	106	13	149	77	0	58	133	87	67	345
Kirkbean	17	5	32	27	0	4	28	28	21	81	*34*	10	5	20	23	0	1	29	12	16	58
Kirkcudbright ...	54	14	122	83	2	15	85	93	82	275	*34*	71	20	116	70	4	12	95	94	80	281
Kirkgunzeon	11	3	12	10	2	22	2	6	8	38	*34*	13	2	10	12	1	23	2	8	5	38
Kirkmabreck	22	18	83	37	1	15	48	66	32	161	*34*	31	5	51	40	0	11	49	50	17	127
Kirkpatrick Durham ...	9	0	21	18	0	0	18	21	9	48	*34*	11	5	28	15	0	1	21	28	9	59
Lochrutton	14	1	13	11	1	17	6	10	7	40	*36*	14	0	9	11	2	12	9	8	7	36
Minnigaff	2	3	22	49	0	11	19	21	25	76	*33*	4	1	18	26	0	10	9	10	20	49
New Abbey	34	10	37	29	0	33	19	18	40	110	*34*	28	7	27	23	3	29	25	9	25	88
Parton	9	1	10	8	1	7	6	10	6	29	*34*	8	3	9	4	0	3	7	13	1	24
Rerrick	31	4	67	28	2	39	46	25	22	132	*34*	23	4	43	30	1	23	35	24	19	101
Terregles	6	1	9	2	0	9	2	2	5	18	*36*	4	2	7	4	2	3	5	6	5	19
Tongland	12	1	17	13	1	6	16	12	10	44	*34*	8	1	14	4	0	2	9	11	5	27
Troqueer	80	16	100	78	6	35	79	105	61	280	*36*	99	13	90	60	2	24	95	88	57	264
Twynholm	21	4	21	20	0	13	20	22	11	66	*34*	17	4	21	15	0	13	17	19	8	57
Urr	143	32	186	140	10	58	185	141	127	511	*34*	134	15	149	133	12	53	162	116	112	443
Totals	712	176	1263	865	30	484	956	923	683	3046	—	783	131	1063	722	36	390	940	815	590	2735
LANARK.																					
Airdrie	619	109	921	490	20	217	779	716	447	2159	*9*	570	91	846	507	18	241	726	582	483	2032
Avondale	150	32	176	94	8	40	141	185	94	460	*1*	79	13	99	58	0	37	87	86	39	249
Biggar	50	4	97	35	0	6	65	77	38	186	*1*	55	14	56	54	1	3	65	63	49	180
Blantyre	261	61	425	226	16	145	310	356	178	989	*15*	226	41	351	204	8	126	242	271	191	830
Bothwell	536	103	855	557	24	258	611	781	425	2075	*7*	551	110	779	470	15	254	562	681	488	1985

Bothwell	536	103	855	557	24	258	611	781	425	2075	*7*	551	110	779	470	15	254	562	681	428	1925
Cadder	157	36	246	117	2	69	179	203	107	558	*12*	183	26	191	112	3	82	179	162	92	515
Calderhead	235	54	322	176	9	88	334	248	126	796	*8*	248	45	331	156	13	124	277	260	132	793
Cambuslang	99	41	347	128	2	23	226	243	125	617	*15*	100	41	342	119	3	19	231	236	119	605
Cambusnethan ...	391	66	668	442	22	240	508	478	363	1589	*4*	412	89	667	416	19	307	419	496	381	1603
Carluke	138	33	293	193	6	52	206	268	137	663	*3*	174	36	255	180	3	55	196	273	124	648
Carmichael	1	1	23	3	0	0	4	20	4	28	*1*	3	2	21	4	0	0	8	19	3	30
Carmunnock	25	3	8	10	0	0	19	21	6	46	*14*	31	2	7	17	0	0	22	23	12	57
Carnwath	123	23	126	88	3	60	102	121	80	363	*2*	122	18	120	73	1	62	113	91	68	334
Carstairs	62	11	70	33	1	53	42	32	50	177	*2*	54	5	77	30	1	48	40	36	43	167
Clarkston	146	18	142	149	9	76	133	151	104	464	*9*	72	11	110	100	5	47	83	95	73	298
Covington & Thankerton	7	0	10	7	0	0	4	14	6	24	*1*	4	1	16	4	0	0	7	9	9	25
Crawford	21	1	17	29	2	17	15	18	20	70	*1*	16	1	13	12	0	7	12	12	11	42
Crawfordjohn	8	2	4	22	0	11	4	8	13	36	*1*	14	1	7	10	0	7	4	10	11	32
Culter	3	1	21	8	2	1	7	20	7	35	*1*	7	0	15	8	0	1	9	19	1	30
Dalziel	931	214	1547	904	50	369	1171	1294	812	3646	*6*	978	165	1384	794	30	366	1129	1126	730	3351
Dolphinton	6	2	10	8	0	7	4	8	7	26	*2*	10	1	10	9	0	4	4	11	11	30
Douglas	46	11	65	59	12	27	52	70	44	193	*1*	74	10	58	56	6	42	42	77	43	204
„ Water ...	38	22	60	44	0	5	84	39	36	164	*1*	36	11	43	55	0	4	71	32	38	145
Dunsyre	5	1	13	1	0	1	6	10	3	20	*2*	6	3	10	0	0	1	5	9	4	19
East Kilbride	40	16	152	47	4	14	69	111	65	259	*3*	48	20	81	44	2	19	54	76	46	195
Glassford	33	7	36	47	0	11	37	44	31	123	*3*	49	5	33	30	3	11	47	46	16	120
Glasgow (Burgh) ...	6609	1597	13520	7798	346	3313	9131	10151	7275	29870	*13*	6125	1387	12447	8244	370	3423	8503	9651	6996	28573
Govan	1986	490	4355	2290	116	1351	2788	2920	2178	9237	*13*	1921	454	4065	2346	99	1253	2752	2747	2133	8885
Hamilton (Burgh) ...	457	79	716	407	31	249	504	575	362	1690	*5*	473	83	624	371	22	239	452	525	357	1573
„ (Landward)	506	95	678	476	22	195	580	603	399	1777	*5*	530	94	605	448	15	192	577	531	392	1692
Lanark (Burgh) ...	121	40	228	100	1	125	74	157	134	490	*2*	130	35	207	80	2	92	101	119	142	454
„ (Landward) ...	130	32	100	72	16	112	73	68	97	350	*2*	127	20	95	77	12	71	122	49	89	331
Larkhall	269	70	584	208	15	228	306	381	231	1146	*3*	308	49	535	231	11	232	324	365	213	1134
Lesmahagow	253	45	361	185	12	174	209	237	236	856	*1*	246	44	336	180	7	168	199	254	192	813
Libberton	13	0	1	1	1	16	0	0	0	16	*2*	5	1	0	6	0	7	0	3	2	12
Maryhill	566	140	1124	570	19	300	760	816	543	2419	*13*	602	111	1017	561	15	301	727	736	542	2306
New Monkland ...	119	18	236	73	2	75	123	169	81	448	*10*	199	25	219	90	3	95	168	161	112	536
Old Monkland ...	572	131	1338	687	31	354	780	1038	587	2759	*11*	666	152	1164	685	22	334	758	958	639	2689
Pettinain	4	2	9	5	0	4	4	5	7	20	*2*	5	0	6	5	0	4	2	7	3	16
Rutherglen	325	68	557	414	15	213	420	390	356	1379	*14*	337	51	535	403	2	224	385	378	341	1328
Shettleston	265	59	488	249	13	120	354	359	241	1074	*11*	231	44	351	214	15	85	257	324	189	855
Shotts	25	6	43	29	4	21	27	30	29	107	*8*	45	6	44	40	0	52	16	35	32	135
Springburn	36	34	234	177	1	6	132	208	136	482	*12*	34	27	152	179	2	15	111	154	114	394
Stonehouse	53	10	88	60	0	40	42	77	52	211	*3*	49	8	110	37	1	31	54	71	49	205
Wandell & Lamington	10	0	7	6	0	0	4	16	3	23	*1*	10	0	10	3	0	0	7	14	2	23
Wiston and Roberton	5	0	8	12	0	0	5	15	5	25	*1*	0	0	3	7	0	0	1	5	4	10
Totals	16455	3788	31329	17736	837	8686	21428	23751	16280	70145	—	16165	3353	28447	17729	729	8685	20150	21888	15700	66423

TABLE XV.—(*continued*).

County and Parish Data.

LINLITHGOW.

Parish	BOYS Hair					BOYS Eyes				BOYS Totals	District	GIRLS Hair					GIRLS Eyes				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Abercorn	23	2	40	20	0	25	18	27	15	85	*48*	26	7	23	17	0	18	17	25	13	73
Bathgate (Burgh) ...	226	54	376	161	12	226	204	218	181	829	*49*	234	34	325	174	4	160	236	211	164	771
„ (Landward)	28	4	22	2	0	15	14	11	16	56	*49*	22	2	14	7	0	16	5	10	14	45
Bo'ness and Carriden	266	90	618	301	21	169	389	444	294	1296	*48*	330	86	526	317	15	209	359	395	311	1274
Dalmeny	46	6	40	24	1	2	52	47	16	117	*48*	52	4	39	18	0	0	59	32	22	113
Ecclesmachan	9	0	15	2	0	6	3	6	11	26	*48*	9	0	5	6	0	11	0	1	8	20
Kirkliston	93	19	147	91	10	72	101	102	85	360	*48*	115	9	112	100	2	77	84	102	75	338
Linlithgow	83	24	139	84	4	21	140	89	84	334	*48*	90	24	144	78	3	23	127	122	67	339
Livingstone	92	11	106	60	2	41	97	92	41	271	*48*	94	12	88	57	1	47	77	80	48	252
Torphichen	79	8	93	45	0	34	59	87	45	225	*49*	79	6	78	50	1	46	61	51	56	214
Uphall	210	67	472	194	4	59	340	396	152	947	*48*	227	44	407	192	3	55	282	373	163	873
Whitburn	144	26	210	110	4	48	208	145	93	494	*49*	181	24	155	87	9	59	191	108	98	456
Totals	1299	311	2278	1094	58	718	1625	1664	1033	5040	—	1459	252	1916	1103	38	721	1498	1510	1039	4768

NAIRN.

Ardclach	7	1	12	11	0	7	12	11	1	31	*90*	17	3	6	11	0	8	9	13	7	37
Auldearn	31	5	44	31	3	30	39	18	27	114	*89*	24	7	29	23	1	22	28	18	16	84
Cawdor	23	4	39	22	0	3	31	33	21	88	*89*	22	3	32	21	1	10	22	29	18	79
Nairn (Burgh) ...	55	7	92	16	1	19	36	90	26	171	*89*	55	10	90	41	1	36	39	88	34	197
„ (Landward) ...	20	8	45	17	0	17	53	14	6	90	*89*	35	7	27	17	0	20	39	25	2	86
Totals	136	25	232	97	4	76	171	166	81	494	—	153	30	184	113	3	96	137	173	77	483

ORKNEY.

ORKNEY.

Cross and Burness ...	24	3	19	18	0	19	13	24	8	64	*109*	24	2	19	14	0	22	12	22	3	59
Eday	8	0	10	11	0	0	13	11	5	29	*109*	14	0	6	4	0	0	14	8	2	24
Evie and Rendall ...	10	1	5	10	0	5	12	5	4	26	*109*	12	5	7	11	0	11	9	13	2	35
Firth and Stennis ...	36	4	44	29	6	16	35	47	21	119	*109*	22	7	28	33	5	7	24	40	24	95
Harray and Birsay ...	17	2	44	23	1	9	22	41	15	87	*109*	32	4	43	16	0	6	40	32	17	95
Holm	26	6	24	11	1	27	13	16	12	68	*109*	30	6	16	6	2	30	11	12	7	60
Hoy and Graemsay ...	16	4	23	6	1	19	14	10	7	50	*109*	12	1	10	8	0	13	9	3	6	31
Kirkwall (Burgh) ...	90	18	169	76	7	44	116	145	55	360	*109*	81	12	146	65	2	47	114	83	62	306
„ (Landward)	0	0	2	2	0	0	2	2	0	4	*109*	2	1	0	1	0	0	2	2	0	4
Lady	24	2	27	22	1	1	20	40	15	76	*109*	13	4	22	26	0	0	19	31	15	65
Orphir	38	1	25	19	0	10	33	30	10	83	*109*	49	5	13	16	0	10	37	29	7	83
Rousay and Egilshay ...	9	4	18	27	0	28	3	8	19	58	*109*	14	3	18	14	1	14	9	9	18	50
St Andrews & Deerness	25	2	23	27	1	16	15	35	12	78	*109*	32	2	27	9	0	17	18	27	8	70
Sandwick	13	3	13	18	0	2	7	19	19	47	*109*	9	3	8	13	0	4	3	13	13	33
Shapinsay	9	4	26	13	0	4	22	25	1	52	*109*	12	1	24	6	0	8	16	17	2	43
South Ronaldshay and Burray	33	21	115	44	3	39	85	57	35	216	*109*	61	11	81	41	4	47	69	57	25	198
Stromness	48	17	85	47	3	13	79	62	46	200	*109*	46	14	74	40	4	22	51	60	45	178
Stronsay	41	3	42	10	0	16	38	34	8	96	*109*	31	1	43	14	0	12	21	42	14	89
Walls and Flotta ...	42	4	41	19	3	24	31	34	20	109	*109*	30	3	28	30	3	15	26	35	18	94
Westray and Papa Westray	56	2	64	64	0	61	42	46	37	186	*109*	47	2	59	38	0	36	32	42	36	146
Totals	565	101	819	496	27	353	615	691	349	2008	—	573	87	672	405	21	321	536	577	324	1758

SHETLAND.

Bressay	8	2	34	6	0	5	18	15	12	50	*110*	14	4	20	10	0	3	27	10	8	48
Delting	26	5	37	20	2	45	24	10	11	90	*110*	23	3	23	20	7	28	30	7	11	76
Dunrossness	32	14	42	27	0	29	22	46	18	115	*110*	50	9	38	21	0	33	22	48	15	118
Fetlar	8	1	14	1	0	7	3	4	10	24	*110*	12	2	6	1	0	6	6	1	8	21
Lerwick	107	26	197	109	4	103	76	165	99	443	*110*	110	18	157	84	3	82	60	137	93	372
Nesting, Lunnasting, Whalsay & Skerries	36	5	29	24	6	23	33	17	27	100	*110*	44	2	30	16	3	22	20	25	28	95
Northmavine	33	6	35	22	1	22	34	18	23	97	*110*	20	6	23	9	0	11	21	8	18	58
Sandsting & Aithsting	31	5	26	41	0	26	34	23	20	103	*110*	11	5	13	30	0	17	21	14	7	59
Tingwall, Whiteness & Weisdale	21	13	53	35	3	36	27	35	27	125	*110*	34	6	37	18	1	24	17	24	31	96
Unst	29	10	27	33	2	31	22	21	27	101	*110*	25	5	22	19	2	29	16	12	16	73
Walls, Sandness, Papa and Foula	18	2	21	15	0	11	27	7	11	56	*110*	20	0	9	19	0	9	24	7	8	48
Yell	22	2	25	13	3	16	9	21	19	65	*110*	15	4	30	14	2	20	8	17	20	65
Totals	371	91	540	346	21	354	329	382	304	1369	—	378	64	408	261	18	284	272	310	263	1129

TABLE XV.—(*continued*).

County and Parish Data.

PEEBLES.

Parish	BOYS Hair					BOYS Eyes				Totals	District	GIRLS Hair					GIRLS Eyes				Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Drumelzier	2	3	4	1	0	0	1	5	4	10	*41*	2	2	12	1	0	0	4	8	5	17
Innerleithen	80	12	144	53	6	43	70	102	80	295	*41*	85	15	132	81	6	37	74	111	97	319
Kilbucho, Broughton and Glenholm	8	2	7	10	1	10	10	3	5	28	*41*	11	0	19	10	0	8	19	9	4	40
Newlands	12	2	22	19	2	7	23	18	9	57	*41*	12	1	25	13	0	11	13	21	6	51
Peebles	76	30	234	72	1	13	187	145	68	413	*41*	88	19	205	76	2	22	163	143	62	390
Stobo	0	2	12	5	1	10	7	3	0	20	*41*	4	0	12	6	0	12	2	6	2	22
Traquair	11	6	31	11	0	2	17	26	14	59	*41*	15	3	28	9	0	2	26	17	10	55
Tweedsmuir	5	1	14	11	0	5	7	6	13	31	*41*	7	2	11	6	0	7	5	8	6	26
West Linton	20	2	34	16	0	31	8	18	15	72	*41*	20	7	22	15	0	21	9	15	19	64
Totals	214	60	502	198	11	121	330	326	208	985	—	244	49	466	217	8	120	315	338	211	984
PERTH.																					
Abernethy	24	4	44	11	0	15	19	33	16	83	*58*	23	6	21	14	1	9	22	22	12	65
Abernyte	11	6	10	17	0	1	16	21	6	44	*68*	8	1	16	12	0	3	15	13	6	37
Alyth	71	9	101	41	1	44	75	57	47	223	*70*	55	11	73	49	3	45	66	47	33	191
Amulree	7	1	5	11	1	3	18	2	2	25	*71*	6	0	8	6	1	1	8	9	3	21
Ardoch	9	1	19	10	0	2	26	8	3	39	*59*	9	2	10	9	0	1	17	12	0	30
Arngask	2	4	26	17	0	1	16	16	16	49	*58*	5	3	29	22	0	2	12	27	18	59
Auchterarder	66	9	83	70	3	25	83	75	48	231	*58*	58	10	114	78	5	28	73	98	66	265
Auchtergaven	46	7	60	51	5	25	60	44	40	169	*71*	54	11	67	50	4	21	80	41	44	186
Balquhidder	18	2	30	21	1	27	10	15	20	72	*59*	16	1	22	20	4	28	10	9	16	63
Blackford	32	10	39	37	2	7	57	34	22	120	*59*	36	7	44	33	1	12	52	28	29	121
Blair Atholl	31	6	45	41	1	11	35	50	28	124	*76*	37	5	34	25	0	9	33	42	17	101
Blairgowrie	141	16	88	83	17	72	38	123	112	345	*70*	129	19	55	83	10	71	31	91	103	296
Blairingone	12	4	6	12	1	12	3	10	10	35	*57*	16	3	14	13	0	14	9	13	10	46
Callander	46	3	22	35	10	18	37	30	31	116	*59*	25	4	34	32	11	10	31	37	28	106
Caputh	29	3	30	23	2	10	34	25	18	87	*71*	22	4	18	19	3	12	26	19	9	66
Cargill	39	9	41	26	0	35	22	35	23	115	*70*	47	6	27	30	0	30	25	33	22	110
Clunie	10	4	23	7	0	15	18	3	8	44	*70*	16	6	8	10	0	18	12	1	9	40
Collace	16	3	29	20	1	3	20	21	25	69	*70*	11	3	19	10	2	9	17	10	9	45
Comrie	26	12	76	41	2	30	55	40	32	157	*58*	41	8	52	60	2	34	56	51	22	163
Coupar Angus ...	79	7	90	56	5	46	62	69	60	237	*68*	80	14	81	63	3	24	61	87	69	241
Crieff	94	14	164	98	7	64	106	134	73	377	*58*	112	16	139	72	4	61	104	107	71	343
Dron	6	1	4	3	0	0	4	8	2	14	*58*	8	2	2	3	0	1	6	7	1	15
Dull	33	8	84	26	10	30	63	37	31	161	*68*	39	8	84	26	10	30	63	37	31	161

Comrie	26	12	76	41	2	30	55	40	32	157	58	41	6	81	63	3	24	61	87	69	241
Coupar Angus ...	79	7	90	56	5	46	62	69	60	237	68	80	14	81	63	3	24	61	87	69	241
Crieff	94	14	164	98	7	64	106	134	73	377	58	112	16	139	72	4	61	104	107	71	343
Dron	6	1	4	3	0	0	4	8	2	14	58	8	2	2	3	0	1	6	7	1	15
Dull	33	8	84	88	10	29	68	55	71	223	71	60	8	72	81	2	43	52	69	59	223
Dunblane and Lecropt	56	16	127	58	4	49	67	90	55	261	59	63	11	115	67	2	42	87	85	44	258
Dunkeld and Dowally	28	7	51	26	2	19	26	40	29	114	71	32	5	44	24	1	15	26	41	24	106
Dunning	17	6	52	27	1	18	38	30	17	103	58	17	7	49	11	1	28	19	29	9	85
Errol	44	7	66	48	3	63	28	30	47	168	68	56	2	58	48	4	55	29	34	50	168
Findo-Gask	5	0	10	9	0	0	6	8	10	24	58	5	2	14	8	0	2	10	6	11	29
Forgandenny	15	0	8	2	0	5	14	6	0	25	58	11	3	14	1	0	3	19	7	0	29
Forteviot	5	3	27	14	0	1	13	31	4	49	58	16	2	18	13	0	0	19	21	9	49
Fortingall	9	4	15	10	1	7	17	7	8	39	71	9	4	14	3	0	13	11	1	5	30
Fowlis Wester ...	15	7	18	12	1	20	13	6	14	53	71	12	3	12	6	1	14	6	9	5	34
Gartmore	15	0	15	25	2	7	21	22	7	57	59	16	1	6	12	1	7	11	7	11	36
Glendevon	7	0	4	2	0	3	9	0	1	13	57	6	0	3	5	3	5	8	0	4	17
Inchture	11	5	24	13	0	7	8	17	21	53	68	10	5	20	17	0	13	7	17	15	52
Kenmore	35	0	35	23	3	22	27	23	24	96	71	32	4	25	24	0	14	31	21	19	85
Killin	35	1	38	16	3	13	51	21	8	93	71	23	3	31	32	0	16	41	18	14	89
Kilmadock	50	6	65	31	2	17	60	43	34	154	59	59	9	68	51	6	15	78	61	39	193
Kilspindie	14	8	15	2	3	5	24	1	12	42	68	16	2	21	0	2	1	25	0	15	41
Kincardine	13	4	56	32	1	16	34	38	18	106	59	22	6	55	22	0	15	48	27	15	105
Kinclaven	4	0	3	5	0	0	6	2	4	12	70	8	2	8	2	0	0	13	4	3	20
Kinfauns	13	2	17	11	1	6	9	21	8	44	68	13	1	13	4	0	7	2	16	6	31
Kinloch-Rannoch ...	3	1	11	3	3	9	1	7	4	21	76	8	0	7	2	2	7	0	6	6	19
Kinnaird	11	1	2	8	0	1	4	8	9	22	68	9	0	7	4	2	0	6	7	9	22
Kirkmichael	2	0	4	6	0	4	0	3	5	12	76	1	0	9	4	0	5	3	2	4	14
Lethendy and Kinloch	7	1	16	7	0	8	12	3	8	31	70	6	1	12	3	0	7	6	1	8	22
Little Dunkeld ...	22	2	24	12	0	11	28	15	6	60	71	11	0	33	7	1	3	29	14	6	52
Logie Almond ...	8	4	36	14	4	23	12	23	8	66	71	7	3	22	18	5	17	7	21	10	55
Logierait	33	3	22	12	0	10	27	21	12	70	71	31	2	12	9	1	10	21	18	6	55
Longforgan	18	1	24	13	0	11	18	18	9	56	68	16	7	19	13	0	6	9	20	20	55
Maderty	13	4	3	3	0	0	4	17	2	23	58	20	1	1	7	0	0	7	12	10	29
Meigle	29	4	39	20	6	26	29	27	16	98	68	27	5	29	15	5	23	20	17	21	81
Methven	28	6	37	25	2	6	42	31	19	98	71	23	4	43	40	2	9	50	27	26	112
Moulin	7	0	5	0	2	9	2	1	2	14	76	7	3	1	6	0	9	3	2	3	17
Muckart	11	3	14	4	2	2	21	6	5	34	51	9	3	12	1	0	4	10	10	1	25
Muthill	5	8	50	18	1	15	28	29	10	82	58	8	11	42	22	3	7	43	21	15	86
Persie	5	1	23	9	3	9	19	1	12	41	70	6	0	12	3	4	8	9	1	7	25
Perth (Burgh)	628	106	1019	558	18	275	697	793	564	2329	69	624	108	951	516	14	287	630	781	515	2213
„ E. Parish (Land.)	17	3	23	21	2	3	13	27	23	66	69	19	5	37	23	0	9	27	26	22	84
Port of Monteith ...	1	0	13	1	0	4	3	7	1	15	59	6	0	16	2	0	2	10	9	3	24
Redgorton	9	2	6	14	3	0	12	14	8	34	70	13	3	8	10	11	0	21	11	13	45
Rhynd	1	2	11	2	0	4	4	6	2	16	58	5	2	5	6	0	1	4	7	6	18
St Martin's	14	1	15	10	0	13	11	9	7	40	70	21	2	16	7	0	9	14	11	12	46
Scone	37	15	76	61	1	26	50	77	37	190	70	45	8	59	49	0	24	37	57	43	161
Tenandry	5	1	9	5	1	2	7	8	4	21	76	4	2	13	13	0	2	12	15	3	32
Tibbermore	5	1	7	18	0	6	13	4	8	31	70	3	1	9	12	0	6	5	8	6	25
Trinity Gask	4	1	2	10	1	9	0	1	8	18	58	7	0	5	8	0	10	0	1	9	20
Trossachs	9	4	15	8	0	23	4	2	7	36	59	7	0	7	7	3	12	1	0	11	24
Weem	1	0	15	5	0	1	12	4	4	21	71	3	1	10	2	0	2	9	3	2	16
Totals	2172	394	3286	2052	145	1283	2426	2506	1834	8049	—	2246	394	2944	1953	130	1230	2301	2385	1751	7667

TABLE XV.—(*continued*).

County and Parish Data.

RENFREW.

Parish	BOYS HAIR					BOYS EYES				BOYS Totals	District	GIRLS HAIR					GIRLS EYES				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Cathcart	300	83	657	358	12	203	398	481	328	1410	*14*	333	61	624	335	21	197	442	437	298	1374
Eastwood	246	55	375	270	5	195	239	311	206	951	*16*	230	36	320	249	6	88	251	311	191	841
Erskine	35	1	39	28	3	42	23	20	21	106	*21*	30	4	31	26	4	37	21	13	24	95
Greenock (Burgh) ...	760	198	1749	946	47	546	1073	1205	876	3700	*24*	762	178	1569	984	32	504	1039	1177	805	3525
„ and Port Glasgow	68	7	76	45	0	29	88	52	27	196	*21*	45	16	89	34	3	40	64	43	40	187
Houston and Killallan	29	6	54	30	2	6	42	40	33	121	*17*	39	6	35	18	3	15	32	36	18	101
Inverkip	6	1	33	14	0	3	11	29	11	54	*23*	8	1	16	17	0	3	13	14	12	42
Kilbarchan	70	16	154	106	3	41	144	87	77	349	*17*	78	20	136	115	0	34	123	105	87	349
Kilmalcolm	49	14	103	43	0	10	75	82	42	209	*21*	49	5	65	41	0	24	47	63	26	160
Levern	29	7	75	37	1	1	33	91	24	149	*16*	30	1	50	35	5	0	30	66	25	121
Lochwinnoch	51	17	118	45	2	22	69	91	51	233	*17*	58	11	132	77	0	27	75	118	58	278
Mearns	85	17	119	67	1	46	90	89	64	289	*16*	101	14	98	73	1	39	100	85	63	287
Neilston	238	48	330	223	12	157	278	267	149	851	*17*	183	32	301	192	13	86	243	236	156	721
Paisley (Burgh) ...	626	128	1069	550	62	417	659	783	576	2435	*18*	575	121	977	605	56	435	636	705	558	2334
„ (Landward) ...	79	9	81	56	3	18	88	65	57	228	*20*	83	8	90	60	5	11	90	64	81	246
Port Glasgow (Burgh)	130	28	279	128	13	83	136	231	128	578	*21*	107	16	240	134	5	67	103	210	122	502
Renfrew (Landward) ...	159	45	327	181	10	61	236	275	150	722	*19*	153	44	322	192	15	51	223	262	190	726
Totals	2960	680	5638	3127	176	1880	3682	4199	2820	12581	—	2864	574	5095	3187	169	1658	3532	3945	2754	11889
ROSS AND CROMARTY.																					
Alness	1	3	6	2	0	3	8	1	0	12	*93*	2	2	4	0	0	0	3	5	0	8
Applecross	36	11	51	20	11	22	51	33	23	129	*99*	41	11	35	29	1	19	48	36	14	117
Avoch	47	7	43	35	0	47	16	42	27	132	*93*	57	3	64	22	0	47	23	39	37	146
Barvas	91	5	87	41	7	56	79	34	62	231	*108*	80	7	87	49	6	57	75	39	58	229
Carnoch	2	0	3	4	0	0	4	5	0	9	*93*	6	0	3	5	0	2	7	4	1	14
Contin	0	0	5	1	0	1	1	3	1	6	*93*	1	0	4	2	0	1	2	2	2	7
Cromarty	1	0	10	8	0	1	7	10	1	19	*93*	5	0	23	0	0	2	18	7	1	28
Dingwall	93	18	95	91	6	60	101	73	69	303	*93*	96	16	86	89	13	60	89	80	71	300
Fearn	31	5	35	51	2	2	50	50	22	124	*95*	31	4	44	47	2	1	46	48	33	128
Fodderty	32	5	62	37	0	26	49	41	20	136	*93*	34	7	60	30	1	24	34	54	20	132
Gairloch	56	11	100	90	8	51	103	73	38	265	*99*	63	12	90	60	9	42	89	58	45	234

Fearn	31	5	33	31	2	24	43	34	20	121	93	30	6	53	32	2	20	30	44	18	112
Fodderty	32	5	62	37	0	26	49	41	20	136	93	34	7	60	30	1	24	34	54	20	132
Gairloch	56	11	100	90	8	51	103	73	38	265	99	63	12	90	60	9	42	89	58	45	234
Glenshiel	6	0	6	6	0	1	7	6	4	18	99	9	1	10	4	0	1	7	13	3	24
Killearnan	18	0	25	18	1	8	20	22	12	62	93	21	2	18	17	2	3	19	25	13	60
Kilmuir Easter ...	35	5	26	11	7	21	30	20	13	84	95	37	3	19	20	2	24	27	22	8	81
Kincardine	12	7	13	23	0	8	11	25	11	55	96	21	2	18	16	2	14	22	16	7	59
Kinloch Luichart ...	10	0	9	11	0	12	3	9	6	30	93 & 99	18	1	5	12	1	16	7	7	7	37
Knockbain	15	4	28	26	5	18	16	22	22	78	93	22	1	38	27	2	22	20	24	24	90
Lochalsh	28	9	38	31	4	30	11	44	25	110	99	29	2	17	34	1	20	9	32	22	83
Lochbroom	71	21	83	70	4	21	81	92	55	249	99	82	15	62	60	4	29	73	79	42	223
Lochcarron	3	2	11	14	0	1	9	14	6	30	99	5	3	16	16	2	10	15	7	10	42
Lochs	149	19	142	139	5	85	168	115	86	454	108	147	19	117	123	12	86	132	99	101	418
Logie Easter	3	4	16	15	6	25	9	7	3	44	95	10	0	9	9	4	20	2	6	4	32
Nigg	19	0	23	20	0	13	9	26	14	62	93	19	0	15	21	0	19	9	15	12	55
Resolis	20	2	28	11	0	16	24	20	1	61	93	25	0	32	30	6	29	25	34	5	93
Rosemarkie	44	8	62	40	2	27	49	49	31	156	93	52	6	53	35	0	26	60	34	26	146
Rosskeen	24	8	53	43	2	7	55	49	19	130	95	45	13	58	43	2	11	65	59	26	161
Stornoway	121	47	324	143	10	104	152	242	147	645	108	131	46	275	156	9	97	115	267	138	617
Tain	39	12	71	54	5	30	59	61	31	181	95	36	8	56	43	1	19	53	41	31	144
Tarbat	31	5	54	35	1	36	26	42	22	126	95	35	2	54	47	1	35	25	41	38	139
Uig	146	19	162	67	9	117	118	103	65	403	108	111	17	125	60	9	93	89	91	49	322
Urquhart and Logie Wester	38	10	65	50	2	17	55	47	46	165	93	47	8	53	45	0	18	46	46	43	153
Urray	53	9	41	34	0	37	47	41	12	137	93	45	10	45	28	0	32	49	39	8	128
Totals	1275	256	1777	1241	97	903	1428	1421	894	4646	—	1363	221	1595	1179	92	879	1303	1369	899	4450

ROXBURGH.

Ancrum	26	4	40	17	0	22	15	19	31	87	39	23	2	16	11	0	19	5	11	17	52
Bedrule	3	2	7	6	0	2	6	10	0	18	39	2	0	1	1	0	1	1	2	0	4
Bowden	5	6	16	14	1	3	19	9	11	42	39	10	4	18	13	2	7	19	7	14	47
Castleton	3	3	15	3	0	0	11	11	2	24	37	3	2	7	6	0	3	8	5	2	18
Cavers and Kirkton ...	28	2	43	20	0	7	37	25	24	93	38	28	4	30	14	1	3	29	26	19	77
Crailing	2	0	18	3	0	0	15	6	2	23	39	8	0	18	3	0	6	18	1	4	29
Eckford	9	1	10	2	0	10	1	11	0	22	39	12	0	10	0	0	9	0	11	2	22
Edgerston	2	0	6	5	2	0	3	8	4	15	39	3	2	13	8	1	0	2	20	5	27
Ednam	18	4	34	5	2	10	32	12	9	63	39	20	3	16	5	2	6	17	7	16	46
Hawick (Burgh) ...	254	50	336	175	11	122	266	270	168	826	38	244	41	324	169	8	122	241	231	192	786
„ (Landward) ...	25	6	25	22	1	11	43	7	18	79	38	26	6	14	19	2	5	32	14	16	67
Hobkirk	5	5	30	6	0	23	14	5	4	46	39	6	0	25	7	0	16	10	10	2	38
Jedburgh	113	30	110	86	4	73	93	69	108	343	39	84	21	101	69	2	47	86	64	80	277
„ (Landward) ...	9	4	17	9	0	8	6	16	9	39	39	10	0	16	18	1	10	5	25	5	45
Kelso	43	3	73	44	0	33	42	49	39	163	39	43	15	51	52	1	42	43	34	43	162
Lilliesleaf	17	4	13	13	3	17	8	10	15	50	39	22	2	12	11	4	14	14	12	11	51
Linton	8	1	6	11	1	3	8	13	3	27	39	2	2	12	7	0	6	7	2	8	23
Makerstoun	9	0	16	5	0	3	7	8	12	30	39	8	1	10	9	2	2	9	8	11	30

TABLE XV.—(*continued*).

County and Parish Data.

ROXBURGH.—(*continued*).

Parish	BOYS Hair					BOYS Eyes				BOYS Totals	District	GIRLS Hair					GIRLS Eyes				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Maxton	4	1	8	14	0	13	2	5	7	27	*39*	8	1	11	5	0	4	10	6	5	25
Melrose	63	20	158	62	3	50	92	97	67	306	*39*	77	17	117	56	5	40	78	91	63	272
Minto	7	0	22	3	0	0	11	11	10	32	*39*	6	1	26	2	0	0	9	18	8	35
Morebattle	22	2	21	7	1	15	16	19	3	53	*39*	16	4	12	8	1	0	16	19	6	41
Oxnam	3	0	6	5	0	1	6	4	3	14	*39*	2	0	4	4	0	0	3	2	5	10
Roberton	15	3	10	13	0	4	16	11	10	41	*38*	10	1	7	9	1	5	7	7	9	28
Roxburgh	11	2	25	22	2	13	6	17	26	62	*39*	22	0	22	15	0	10	19	19	11	59
St Boswell's	10	3	15	17	0	8	11	10	16	45	*39*	13	1	21	9	0	9	10	10	15	44
Smailholm	13	2	12	4	0	7	20	2	2	31	*39*	20	1	11	10	0	0	26	10	6	42
Southdean	9	2	16	14	0	6	11	12	12	41	*39*	14	5	8	14	1	9	13	12	8	42
Sprouston	21	3	17	19	0	22	16	5	17	60	*38*	17	4	12	12	0	17	13	5	10	45
Teviothead	12	0	5	6	1	6	6	5	7	24	*39*	18	2	9	6	1	8	15	4	9	36
Yetholm	25	5	25	7	0	1	24	26	11	62	*39*	23	5	30	15	0	3	25	30	15	73
Totals	794	168	1155	639	32	493	863	782	650	2788	—	800	147	984	587	35	423	790	723	617	2553
SELKIRK.																					
Ashkirk	13	0	13	5	0	6	9	9	7	31	*38*	7	1	7	4	0	4	7	3	5	19
Caddonfoot	15	2	15	15	0	25	6	9	7	47	*40*	15	2	6	12	0	11	8	7	9	35
Ettrick	7	1	6	5	0	1	9	6	3	19	*40*	3	3	10	3	0	0	7	9	3	19
Galashiels (Burgh) ...	200	48	439	137	12	125	179	349	183	836	*40*	216	40	335	110	10	116	178	279	138	711
,, (Landward)	3	0	2	4	0	2	4	2	1	9	*40*	3	2	4	1	1	1	5	2	3	11
Kirkhope	15	3	9	11	2	2	18	7	13	40	*40*	8	1	9	14	0	3	14	5	10	32
Selkirk (Burgh) ...	50	11	85	36	0	47	40	65	30	182	*40*	37	11	98	54	0	40	43	70	47	200
,, (Landward) ...	5	1	7	6	0	10	4	4	1	19	*40*	9	3	8	2	1	13	7	2	1	23
Yarrow...	12	2	15	10	0	5	8	10	16	39	*40*	11	0	7	9	0	4	7	7	9	27
Totals	320	68	591	229	14	223	277	461	261	1222	—	309	63	484	209	12	192	276	384	225	1077

STIRLING.

STIRLING.

Airth	31	6	64	31	2	23	38	37	36	134	*61*	50	3	58	24	1	27	31	45	33	136
Baldernock	0	4	9	16	0	4	15	9	1	29	*12*	7	5	17	11	0	6	16	13	5	40
Buchanan	7	2	7	11	2	4	5	5	15	29	*59*	10	0	11	9	1	8	11	5	7	31
Campsie	23	5	43	30	0	1	50	42	8	101	*12*	18	4	51	12	0	1	46	28	10	85
Denny	167	34	361	214	15	141	211	266	173	791	*63*	187	24	326	196	25	136	176	259	187	758
Drymen	18	0	32	31	2	16	14	18	35	83	*59*	16	3	42	25	4	27	25	14	24	90
Dunipace	15	0	9	4	1	5	4	15	5	29	*62*	7	0	7	0	0	1	6	7	0	14
Falkirk (Burgh) ...	262	44	521	303	12	179	331	333	299	1142	*62*	231	43	450	300	9	162	297	314	260	1033
,, (Landward) ...	54	7	66	38	4	33	61	43	32	169	*63*	40	6	60	37	2	20	53	38	34	145
Fintry	9	1	2	18	2	7	9	4	12	32	*59*	8	5	3	6	1	1	10	5	7	23
Gargunnock	28	1	16	14	0	21	20	11	7	59	*59*	12	0	9	4	0	9	12	2	2	25
Grangemouth	307	70	475	326	26	242	326	386	250	1204	*61*	305	57	375	254	13	200	273	305	226	1004
Kilsyth (Town) ...	184	34	344	180	2	73	286	231	154	744	*12*	182	41	348	153	2	42	314	230	140	726
,, (Landward) ...	75	18	54	83	2	63	47	59	63	232	*12*	68	11	74	55	4	53	46	55	58	212
Kippen...	6	3	49	13	0	7	24	20	20	71	*59*	24	4	47	10	0	8	32	16	29	85
Larbert	308	79	590	377	18	161	396	533	282	1372	*62*	325	62	567	329	16	179	371	485	264	1299
Logie	26	1	12	10	1	5	24	13	8	50	*59*	20	1	12	13	0	13	15	8	10	46
Muiravonside	133	20	198	120	7	91	134	154	99	478	*61*	155	18	152	116	10	88	147	105	111	451
St Ninians	185	24	157	100	4	98	187	107	78	470	*59*	172	25	147	95	3	96	179	101	66	442
Slamannan	125	33	283	138	2	63	167	251	100	581	*10*	127	23	223	115	0	52	141	193	102	488
Stirling (Burgh) ...	307	78	699	340	23	150	453	502	342	1447	*60*	374	60	695	357	12	165	442	515	376	1498
Strathblane	15	1	23	17	2	12	75	19	12	58	*12*	13	2	27	14	2	16	18	6	18	58
Totals	2285	465	4014	2414	127	1399	2817	3057	2032	9305	—	2351	397	3701	2135	105	1310	2661	2749	1969	8689

SUTHERLAND.

Assynt	19	9	36	14	0	14	30	16	18	78	*96*	41	6	30	17	1	18	37	11	29	95
Clyne	42	6	54	36	3	21	40	37	43	141	*96*	55	4	51	27	1	23	45	28	42	138
Creich	14	12	52	28	2	19	27	31	31	108	*96*	16	8	30	16	3	12	26	15	20	73
Dornoch	47	11	77	51	8	14	63	67	50	194	*95*	43	7	71	46	7	18	32	64	60	174
Durness	16	7	3	12	1	5	16	12	6	39	*96*	13	4	10	12	1	7	13	14	6	40
Eddrachillis	21	4	40	32	1	19	18	41	20	98	*96*	33	3	38	24	1	32	26	23	18	99
Farr	65	14	49	37	0	51	31	51	32	165	*96*	56	15	71	29	1	40	40	60	32	172
Golspie...	22	7	50	58	0	7	37	60	33	137	*95*	20	3	59	41	0	3	38	49	33	123
Kildonan	26	6	53	71	0	35	21	56	44	156	*96*	48	5	48	48	0	47	22	39	41	149
Lairg	1	0	5	8	0	5	4	4	1	14	*96*	5	0	1	1	0	2	4	0	1	7
Loth	4	4	14	6	0	6	12	3	7	28	*95*	13	1	10	5	0	9	9	2	9	29
Rogart	24	4	8	25	0	26	11	15	9	61	*96*	36	4	16	13	1	18	22	18	12	70
Tongue...	15	7	53	30	2	14	41	25	27	107	*96*	25	1	47	24	0	13	33	21	30	97
Totals	316	91	494	408	17	236	351	418	321	1326	—	404	61	482	303	16	242	347	344	333	1266

TABLE XV.—(*continued.*)

County and Parish Data.

WIGTOWN.

Parish	BOYS Hair					BOYS Eyes				BOYS Totals	District	GIRLS Hair					GIRLS Eyes				GIRLS Totals
	Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark			Fair	Red	Medium	Dark	Jet Black	Blue	Light	Medium	Dark	
Glasserton	19	5	20	32	1	2	34	24	17	77	*33*	22	1	14	21	0	6	29	13	10	58
Inch	34	13	22	30	1	15	42	30	13	100	*32*	35	4	32	35	0	12	50	22	22	106
Kirkcolm	5	5	20	66	2	25	21	37	15	98	*32*	21	5	13	71	5	34	29	26	26	115
Kirkcowan	33	4	41	27	2	31	23	35	18	107	*33*	44	4	38	24	4	40	25	25	24	114
Kirkinner	23	12	46	52	0	23	34	41	35	133	*33*	41	3	40	27	1	25	37	30	20	112
Kirkmaiden	28	8	43	43	2	24	37	26	37	124	*32*	44	6	50	31	1	32	40	37	23	132
Leswalt	20	9	34	19	1	17	11	29	26	83	*32*	17	6	36	20	6	31	13	14	27	85
Mochrum	9	0	12	15	1	4	23	3	7	37	*33*	10	0	19	15	0	5	20	6	13	44
New Luce	2	3	7	1	0	4	2	5	2	13	*32*	8	1	2	1	0	3	3	6	0	12
Old Luce or Glenluce ...	62	11	102	59	4	73	52	64	49	238	*32*	61	9	74	40	3	54	37	62	34	187
Penninghame	29	11	74	27	5	13	34	66	33	146	*33*	46	14	83	46	3	19	60	65	48	192
Portpatrick	33	3	37	13	0	0	19	62	5	86	*32*	27	7	40	21	0	0	18	70	7	95
Stoneykirk	42	6	36	51	6	23	47	44	27	141	*32*	49	4	41	58	6	44	41	43	30	158
Stranraer (Burgh) ...	137	34	280	87	4	94	162	151	135	542	*32*	144	33	224	117	4	76	180	116	150	522
Whithorn	58	6	85	29	2	21	48	65	46	180	*33*	50	9	105	54	0	25	60	71	62	218
Totals	534	130	859	551	31	369	589	682	465	2105	—	619	106	811	581	33	406	642	606	496	2150

TABLE XVI.

Observers and Schools contributing to the Data of the Pigmentation Survey of School Children in Scotland.*

COUNTY OF ABERDEEN.

Burgh of Aberdeen.—Ashley Road, Mr W. Ross (77); Broomhill, Mr R. A. Watson (77); Causewayend, Mr Rose (77); Commerce St., Mr J. Peter (77); Ferryhill, Mr J. D. Anderson (77); Frederick St., ? (77); Hanover St., Mr W. D. McLean (77); King Street, Mr. T. Hynd (77); Kittybrewster, Mr J. McKenzie (77); Marywell Street, Mr W. Fyfe (77); Middle, Mr J. C. Barnett (77); Mile End, Mr J. F. Cruickshank (77); Old Aberdeen, Mr W. B. Duguid (77); Porthill, Mr W. Stewart (77); St Clements Street, Mr D. B. Lothian (77); St Paul Street, Mrs J. S. Skea (77); Skene Square, Mr A. Green (77); Skene Street, ? (77); Westfield, Mr W. Robertson (77); Woodside, Mr J. A. McHardy (77); York Street, Miss Spalding (77); Deaf and Dumb Institution, Mr Alex Pender (77); Normal, U. F. C., ? (77); St Margaret's Mission, Sister Katharine Mary (77); St Peter's, R.C., Mr J. Brady (77); Cathedral, R.C., Mr P. McGrath (77); Gordon's College, Mr C. Stewart (77); Rosemount, Mr J. Findlay (77). Parish of Aberdour—Aberdour, Mr J. Reaich (83); Auchmedden, Mr W. Swanney (83); Parish of Aboyne and Glen Tanar—Aboyne, Mr J. Cruickshank (79); Glen Tanar, Mr W. Walker (79); Parish of Alford—Alford Village, Mr D. C. Crabbe (80); Gallowhill, Mr A. McCreadie (80); Parish of Ardallie—Ardallie, ? (82); Ardallie, Female, Miss J. Kemp (82); Parish of Auchterless—Badenscoth, Mr. Geo. Ironside (82); Kirktown, Mr A. Longmore (82); Parish of Belhelvie—Balmedie, Mr C. E. Glennie (78); Craigie, Miss Fraser (78); Menie, Miss Jane Watt (78); Wester Hatton, Mr M. S. Craib (78); Parish of Birse—Birse, Mr G. Innes (78); Finzean, Mr W. Adams (78); Forest, Miss Eva Shaw (78); Parish of Bourtie —Bourtie, Miss Taylor (80); Parish of Cairney—Alehousehillock, Miss G. Gray (87); Cairney, Mr P. Stuart (87); Ruthven, Mr W. Johnstone (87); Windyraw, Mr A. Middleton (87); Parish of Chapel of Garioch—Chapel, Miss E. J. Fordyce (80); Logie Durno, Mr J. B. Robson (80); Parish of Clatt—Clatt, Mr W. Stewart (80); Parish of Cluny—Cluny, Mr W. Harper (80); Cluny, U. F. C., Miss Deuchars (80); Corennie, Lady Gordon Cathcart's, Miss J. A. Ironside (80); Parish of Coull—Coull, Mr A. Howie (79); Parish of Crathie and Braemar—Aberarder, Miss M. Catto (79); Braemar, Mr J. Badenoch (79); Crathie, Mr W. Brown (79); Crathieside, Mr W. Strath (79); Inverey District, Miss S. MacFarlane (79); Inverey, R. C., Miss M. Dallastone (79); Parish of Cruden—Auchiries, Miss M. Campbell (78); Bogbrae, Mr J. C. Coutts (78); Hatton, Mr W. Littlejohn (78); Errol, Epis., Mr Miller (78); Parish of Culsalmond—Tillymorgan, Mr A. J. Wallace (80); Parish of Drumblade—Drumblade, Mr J. Taylor (87); Parish of Drumoak—Drumoak Central, Mr J. R. Littlejohn (79); Glashmore, Miss J. A. McBeth (79); Parish of Dyce—Dyce Overtown, Miss L. R. Mitchell (80); Dyce village, Mr G. Murray (80); Parish of Echt—Cullerley, Miss M. J. Barron (79); Kirkton, Mr R. C. Burnett (78); Waterton, Miss E. Peace (79); Parish of Ellon—Berefold, Mr R. Thomson (82); Drumwhindle, Mr L. Gavin (82); Ellon, Mr D. Cameron (82); Esslemont, Mr A. Cairns (82); Parish of Fintray—Disblair, Miss J. Meldrum (80); Hatton, Mr C. Smith (80); Parish of Forgue—Forgue, Mr R. Wright (87); Largue, Mr J. Gray (87); Forgue Episc., Miss J. B. Duncan (87); Parish of Foveran—Cultercullen, Mr J. Rose (78); Foveran, Mr J. Watson (78); Newburgh Mathers, Mr Williams (78); Parish of Fraserburgh—Fraserburgh, Mr J. A. Sutor (83); Fraserburgh,

* The figures in brackets refer to the Districts, where blanks with a query occur, the names of teachers were not supplied.

Infant, Miss Milne (83); Academy, Elementary Dept., Mr R. Lees (83); Broadsea, Mr J. W. Broome (83); Female Industrial, Miss N. Brown (83); St Peter's Episc., Mr J. Gray (83); Parish of Fyvie—Fyvie, Mr A. Bremner (82); Steinmanhill, Miss J. A. Calder (82); Woodhead, Mr D. Davidson (82); All Saints' Epis., Mr M. Sangster (82); St Katharine's, Miss A. Forbes (82); Parish of Gartly—Braes, Miss J. W. Emslie (87); Central, Mr W. Smith (87); Parish of Glass—Beldorney, Miss M. M. Duguid (87); Glass, Mr D. Wood (87); Parish of Glenbucket—Glenbucket, Mr J. N. Watt (80); Parish of Glenmuick and Tullich—Ballater, Mr J. Lawson (79); Birkhall, Miss A. Begg (79); Inchmarnock—Miss C. Forbes (79); Kinnord, Miss R. Begg (79); Parish of Huntly—Gordon, Mr D. M. J. James (87); Kinnoir, Miss A. Allardyce (87); Longhill, Mrs H. Kemp (87); Parish of Insch—Insch, ? (80); Parish of Inverurie—Market Place, Mr J. Philip (80); Infant School, Mr J. Rennie (80); St Mary's Epis., Mr J. Stuart (80); Parish of Keig—Keig, ? (80); Parish of Keithhall and Kinkell—Keithhall, Mr Geo. Kemp (80); Parish of Kennethmont—Kennethmont, Mr G. Cheyne (80); Old Town, Mr P. Campbell (80); Parish of Kincardine O'Neil—Greenburn, Miss J. A. Ogg (79); Kincardine O'Neil, Mr A. T. Ross (79); Tornaveen, Mr P. Wallace (79); Torphins, Mr J. W. Williams (79); Parish of King Edward—King Edward, Mr J. Elphinstone (86); Parish of Kininmonth—Kininmonth, Mr G. M. Farquharson (84); Parish of Kinellar—Kinellar, Mr A. Forrest (80); Parish of Kintore—Kintore, Mr W. Keys (80); Leylodge, Miss A. Riach (80); Port Elphinstone—Mr J. Ritchie (80); Parish of Leochel Cushnie—Cairncoullie, Mr G. Shearer (80); Corse, Mr E. S. Mearns (80); Craigievar, Mr A. Grassick (80); Cushnie, ? (80); Parish of Leslie—Leslie, Mr G. Riddell (80); Parish of Logie Buchan—Tipperty, Mr L. Smart (78); Parish of Logie Coldstone—Logie Coldstone, Mr J. B. Anderson (79); Migvie, Miss E. Robertson (79); Parish of Longside—Kinmundy, Mr. A. McD. Younie (84); Longside, Mr A. Center (84); Rora, Mr A. F. Annand (84); Parish of Lonmay—Blackhills, Mr L. McLeod (83); Lonmay, Mr J. S. Ewen (83); St Combs, Mr R. Mirrless (83); Parish of Lumphanan—Lumphanan, Mr R. McLean (79); Parish of Meldrum—Commercial Road, Mr C. F. Bearsley (82); Kirk St., Infant, Miss McRae (82); Tulloch, Miss M. Cooper (82); Parish of Methlick—Cairnorrie, Mr J. Macdonald (82); Methlick, Mr A. C. Kirton (82); Parish of Midmar—Midmar and Corsindae Memorial, Mr J. Grant (79); Parish of Millbrex—Millbrex, Male, Mr. P. McDonald (82); Millbrex District, Mr E. Ironside (82); Parish of Monquhitter—Garmond, Miss M. A. Lyall (82); Greeness, Mr J. M. Stephen (82); Monquhitter, Mr W. Barclay (82); Parish of Monymusk—Monymusk, Mr A. W. Simpson (80); Sir Arthur Grant's, Miss E. M. Scott (80); Tillyfourie, Miss M. Main (80); Parish of New Byth—New Byth, Mr M. A. Clark (86); Upper Brae, Miss J. Wilson (86); Parish of New Deer—Cairnbanno, Mr J. Macpherson (84); Knaven, Mr W. Hadden (84); New Deer, Mr H. Cowie (84); do. Infant, Miss Morrison (84); Oldwhat, Mr A. Dunbar (84); Whitehill, Mr G. Greig (84); Bonnykelly, Miss A. B. Oliphant (84); Parish of Newhills—Blackburn, Mr J. Ligertwood (78); Bucksburn, Mr M. G. Gerrard (78); Kepplehills, Miss Jackson (78); Kingswells, Mr D. J. Williamson (78); Stoneywood, Mr C. Frazer (78); Parish of New Machar—New Machar, Mr J. G. Moncur (78); Parkhill, Miss A. J. Crane (78); Whiterashes, Mr J. McGregor (78); Parish of New Pitsligo—Glasslaw, Miss E. Davidson (84); New Pitsligo, Mr J. Will (84); St John's Episc., Miss Fowlie (84); Parish of Old Deer—Bulwark, Miss Watters (84); Clochan, Mr R. D. Robertson (84); Fetterangus, Mr. W. Scorgie (84); Maud, Mr J. Law (84); Old Deer, Mr J. B. Gillies (84); Shannas, Mr P. S. Pyper (84); Stuartfield, Miss S. M. Thomson (84); Parish of Old Machar—Bridge of Don, Miss B. W. Killoh (78); Denmore, Miss A. Robertson (78); Whitestripes, Miss A. Dey (78); Parish of Oyne—Oyne, Mr Riddell (80); Parish of Peterculter—Countesswells, Miss A. M. Duncan (78); Craigton, Mr D. A. Farquhar (78); Cults, Mr F. Croll (78); Eddieston, Miss J. Rennie (78); Burgh of Peterhead—Academy, Mr J. Don (81); Buchanhaven, Miss J. C. King (81); Central, Mr A. McD. Reid (81); Infant, Miss A. Forbes (81); North, Mr W. Murray (81); North, Infant, Miss E. Barclay (81); St Peter's Epis., Miss E. Bruce (81); Parish of Peterhead (Landward)—Blackhills, Mr W. Smith (81); Boddam, Mr S. McKim (81); Burnhaven, Mr D. J. Mitchell (81); Parish of Pitsligo—Pitsligo, Miss H. Strachan (83); Rosehearty, Mr A. Forbes (83); Sandhaven, Mr W. J. Caird (83); Parish of Premnay—

Premnay, Mr W. L. H. Cruickshank (80); Parish of Rathen—Inverallochy, Mr D. C. Dundas (13); Rathen, Mr J. Jack (83); Cortes, Mr E. Cowie (83); Parish of Rayne—North, Mr W. Black (80); Old Rayne, Miss M. U. Morrice (80); Parish of Rhynie—Duffs, Miss A. McGillivray (87); Lesmore, ? (87); Parish of St Fergus—Central, Mr J. Cormack (81); Northern, Miss J. Gall (81); Parish of Savoch—Braeside, Mr W. Ferguson (82); Savoch, Girls, Miss E. Penny (82); Parish of Skene—Central, Mr G. Mitchell (79); Garlogie, Miss J. F. Harper (79); Westhill, Miss A. Mackie (79); Parish of Slains—Collieston, Miss H. Leslie (78); Slains, Mr Harper (78); Parish of Strathdon—Corgarff, Mr A. Merriless (80); Forbeston, Miss F. Rennie (80); Knocklea, Mr J. Forbes (80); Strathdon, Mr J. B. Innes (80); Tillyduke, Mr C. Farquharson (80); Parish of Strichen—Strichen, Miss J. Aiken (84); Techmuiry 2nd, Mr P. Seath (84); All Saints' Epis., Miss M. J. Greig (84); Parish of Tarland—Tarland, Mr J. Forbes (79); Parish of Tarves—Auchedly, Miss C. P. Hay (82); Barthol Chapel, Mr. W. Wilson (82); Craigdam, Mr J. Davidson (82); Parish of Tough—Tough, Mr Chas. Stewart (80); Parish of Towie—Ardlair, Miss J. Collie (80); Towie, Mr J. McLean (80); Parish of Turriff—Ardmiddle, Mr J. Roy (86); Birkenhills, Mr J. Dilworth (86); Fintry, Mr J. Clark (86); Turriff, Mr D. L. Phease (86); Parish of Tyrie—Tyrie, Mr A. Coppland (84); Parish of Udny—Udny Green, Mr W. Sim (82); Parish of Ythan Wells—Corse, Miss J. Tocher (82); Ythan Wells, Mr J. McPherson (82).

COUNTY OF ARGYLL.

Parish of Acharacle—Eilanshona, Mr J. McGregor (100); Glenborrodale, Miss A. F. Cameron (100); Kinlochmoidart, Miss J. J. Macnaughton (100); Mingarry, Miss K. Edmonson (100); Parish of Ardchattan and Muckairn—Achaleven, Mr W. W. Ewing (101); Glenetive, Mr K. J. Robson (101); Letterwood, Miss A. Connell (101); Parish of Ardgour—Ardgour, Miss Stuart (100); Duisky, Miss A. McMillan (100); Trislaig, Miss A. Campbell (100); Kingairloch, Miss C. McMillan (100); Parish of Ardnamurchan—Kilchoan, Mr A. C. Storrer (100); Burgh of Campbeltown—Dalintober, Mr D. Fisher (103); Grammar, Mr R. Y. Cunningham (103); Millknowe, Mr J. Kirkwood (103); St Kierans, R. C., Miss T. Fisher (103); Parish of Campbeltown (Landward)—Auchencorvie, Mr J. Templeton (103); Drumlemble, Mr D. Cameron, Kilmichael, Mr W. H. Edgar (103); Peninver, Mr D. M. McNeil (103); Parish of Coll—Acha, Miss M. Tyre (100); Arinagour, Mr R. MacTaggart (100); Cornaig, Mr T. Johnston (100); Parish of Colonsay and Oronsay—Kilchattan, Miss J. Campbell (102); Parish of Craignish—Craignish, Mr J. Kay (101); Barbreck, Miss M. Ferguson (101); Parish of Cumlodden—Furnace, Mr W. G. McKinlay (101); Parish of Dunoon and Kilmun—Ardentinny, Mrs M. C. Giffen (104); Dunoon Grammar, Mr W. Dock (104); Glenlean, ? (104); Innellan, Mr D. Ritchie (104); Kirn, Mr J. Connell (104); Rashfield, Miss J. Bruce (104); Sandbank, Mr A. McNeilage (104); Strone, Mr W. Baird (104); Parish of Gigha and Cara—Gigha, Mr T. Scott (102); Parish of Glassary—Cairnbaan, Miss S. McIntyre (101); Glassary, Mr J. Pemmell (101); Minard, Mr G. Nicolson (101); Parish of Glenaray and Inveraray—Bridge of Douglas, Miss Gibson (101); Parish of Glenorchy and Inishail—Bridge of Orchy, Mrs MacLaine (101); Cladich, Miss C. Russell (101); Dalmally, Mr J. Macdonald (101); Parish of Inverchaolain—Inverchaolain, Mr T. McNab (104); South Hall, Miss J. B. Fraser (104); Parish of Jura—Ardlussa, Miss M. B. Spiers (102); Knockrome, Mr G. H. Fisher (102); Small Isles, Mr W. McLintock (102); Parish of Kilbrandon and Kilchattan—Ardincaple, Miss A. Mackay (101); Luing, Mr C. Clubb (101); North Luing, Miss M. Orr (101); Parish of Kilcalmonell, Clachan, Mr J. Mackie (102); Whitehouse, Mr J. Ross (102); Parish of Kilchoman—Gortan, Mr A. Mackay (102); Kilchoman, Mr A. R. Scott (102); Kilnave, Miss M. R. Hayes (102); Port Charlotte, Mr A. McDougall (102); Portnahaven, Mr N. Orr (102); Rockside, Miss M. Ferguson (102); Parish of Kilchrenan and Dalavich—Ardchonnell, Mr J. McLeod (101); Dalavich, Miss M. Smith (101); Kilchrenan, Mr W. L. Bruce (101); Sonachan, Miss J. G. McKenzie (101); Parish of Kildalton—Ardbeg, Mr H. Bisset (102); Glenegidale, Miss

M. Bell (102); Kintour, Mr J. Marnie (102); Oa, Miss MacDougall (102); Port Ellen, Mr D. McLachlan (102); Parish of Kilfinan—Ardlamont, Miss Simpson (102); Kilfinan, Mr J. MacCallum (102); Millhouse, Mr D. McDonald (102); Otter Ferry, Mrs W. Stewart (102); Tighnabruaich, Mr A. Barrett (102); Parish of Kilfinichen and Kilvickeon—Ardchevaig, Mr A. R. Campbell (100); Bunessan, Mr J. McMaster (100); Creich, Mr A. Stewart (100); Erraid, Miss G. McKechnie (100); Iona, Mr Jas. Wood (100); Pennyghael, Miss C. L. Pagan (100); Parish of Killarrow and Kilmeny—Bowmore, Mr J. Bryce (102); Kiels, Miss M. E. Falconer (102); Kilmeny, Mr W. McFadyen (102); Mulindry, Mr D. MacBean (102); Newton of Kilmeny, Mr W. P. Cameron (102); Parish of Killean and Kilchenzie—Ballochintee, Miss J. McGibbon (103); Glenbarr, Mr W. Agnew (103); Kilchenzie, Mr W. McCulloch (103); Killean, Miss C. Livingston (103); Rhunahaorine, Mr W. Bain (103); Parish of Kilmodan—Kilmodan, Mr J. MacInnes (104); Stronafian, Mr P. A. Munro (104); Parish of Kilmore and Kilbride—Kerrera, Miss M. Rodger (101); Strontoiller, Miss F. C. Sinclair (101); Parish of Kilninian and Kilmore—Fanmore, Miss G. Warnock (100); Morinish, Miss M. Clark (100); Tobermory, Mr J. S. Levack (100); Parish of Kilninver and Kilmelford—Kilmelford, Miss J. B. Robertson (101); Parish of Lismore and Appin—Balachulish, Mr A. McCallum (101); Baligarve, Mr J. Wilson (101); Baligrundle, Mrs Campbell (101); Duror, Mr R. Macgregor (101); Glencreran, Miss M. McKenzie (101); Lettermore, ? (101); Port Appin, Miss A. McGlashan (101); Strath of Appin, Mr D. Macpherson (101); Carnock, Glencoe St Mary's Episcopal, Miss Janet Stewart (101); Parish of Lochgilphead—Ardrishaig, Mr A. Ramsay (101); Parish of Lochgoilhead and Kilmorich—Kilmorich, Mr J. B. Logan (101); Lochgoilhead, Mr W. Gilchrist (101); Parish of Morvern—Bunavullin, Miss H. Stewart (100); Claggan, Miss J. Robertson (100); Lochaline, Mr D. B. Fletcher (100); Parish of North Knapdale—Bellanoch, Mr A. Dixon (102); Parish of Oban; Burgh, High, Mr J. Beattie (101); Parish of Saddell and Skipness—Carradale, Mr J. R. McInnes (102); Saddell, Mr W. Jenkins (102); Skipness, Mr T. Johnston (102); Sperasaig, Mr J. S. Barwell (102); Parish of Southend—Glenbreckrie, Mr R. Montgomery (103); Southend, Mr J. Morton (103); Parish of South Knapdale—Auchoish, Miss J. Campbell (102); Dunmore, Mr D. McArthur (102); Inverneil, Miss L. Mactavish (102); Ormsary, Miss K. Blair (102); Parish of Stralachlan and Strachur—Poll, Mr A. N. Sheridan (101); Stralachlan, Miss J. E. Munro (101); Parish of Strontian—Strontian, Mr D. Cameron (100); Parish of Torosay—Crogan, Miss C. McKinnon (100); Kinlochspelve, Miss Mackinnon (100); Lochdonhead, Mr W. G. MacBean (100); Parish of Tyree—Cornaigmore, Mr D. McKinnon (100); Hillipool, Mr G. McDonald (100); Ruaig, Mr D. Gunn (100).

COUNTY OF AYR.

Parish of Alloway—Alloway, Mr J. Turnbull (31); Parish of Ardrossan—Academy, Mr J. Butters (29); Eglinton, Mr W. Comrie (29); Parish of Auchinleck—Auchinleck, Mr J. Henderson (26); Cronberry, Mr Jas. Hyslop (26); Glenmuir, Miss Mary Stuart (26); Lugar, Mr Wm. Hume (26); Ayr Burgh—Grammar, Mr Hy. Robertson (25); Newton on Ayr Academy, ? (25); Russell Street, Mr A. D. Murphy (25); Ayr Episcopal, Mr Jas. Scott (25); St Margaret's, R. C., Mr L. Gemson (25); Parish of Ballantrae—Auchenflower, Mr J. M. Ferguson (32); Ballachdowan, Miss J. S. Dale (32); Glenapp, Miss J. Leask (32); Parish of Barr—Rowantree, Mr J. Brown (31); Parish of Beith—Academy, ? (30); Greenhills, Mr T. Stevenson (30); Gateside, Mr J. J. Bone (30); Parish of Colmonell—Barrhill, Mr D. Millar (32); Colmonell, Mr A. Beattie (32); Corwar, Mrs Weir (32); Lendalfoot, Miss H. Gray (32); Pinwherry, Miss W. Holms (32); Parish of Coylton—Coylton, ? (31); Littlemill, Mr W. Guthrie (31); Parish of Crosshill—Crosshill, Mr Duncan (31); Kilkerran, Hillside, Miss McCreath (31); Parish of Dailly—Kilgrammie, Mr D. Taylor (31); Wallacetown Works, Mr D. Guthrie (31); Parish of Dalmellington—Benwhat, Mr A. McArthur (31); Lethan Hill, Mr D. Vallance (31); Parish of Dalry—Blairmains, Miss J. McR. Deacon (30); West End,

Mr D. Campbell (30); Parish of Dalrymple—Dalrymple, Mr A. Lockhead (31); Hollybush, Infant, Miss Johnstone (31); Kerse, Mr A. Lyle (31); Parish of Dreghorn—Dreghorn, Mr Jas. Mair (28); Parish of Dundonald—Dundonald, Mr H. Gibb (28); Loans, Miss J. C. Brown (28); Troon, Portland, Mr W. Scott (28); Troon, St Patrick's, Miss Murphy (28); Parish of Dunlop—Dunlop, Mr A. Brown (30); Parish of Fenwick—Fenwick, Mr W. Brown (30); Parish of Galston—Allanton, Miss Hunter (28); Galston, Mr A. Young (28); Town of Girvan—Girvan, Mr M. J. Finlayson (31); Girvan, H. G., Mr M. J. Finlayson (31); Parish of Girvan (Landward)—Assell, Mr H. Raeburn (31); Doune, Mr J. Eaglesome (31); Girvan, Mr D. Thomson (31); Burgh of Irvine—Bank Street, Mr R. Selkirk (28); Fullarton, ? (28); Fullarton, Loudon Street, Mr W. Mitchell (28); Parish of Irvine (Landward)—Annick Lodge, Mr J. Dunlop (28); Parish of Kilbirnie—Glengarnock, Mr R. Gray (30); Ladyland, Mr J. Fulton (30); Female Industrial, Miss Turnbull (30); St Bridget's, R. C., Mr H. McGrath (30); Parish of Kilmarnock (Landward)—Crooked Holm, Mr T. Duncanson (28); Grougar, Mr C. S. Macdonald (28); Rowallan, Mr J. Clelland (28); Burgh of Kilmarnock—Academy, Dr H. Dickie (27); Academy H. G., Dr H. Dickie (27); Bentinck, Mr D. Walker (27); Glencairn, Mr Thos. Amos (27); Hamilton, Mr G. H. Innes (27); High Street, Mr G. Smith (27); West Netherton, ? (27); Parish of Kilmaurs—Crosshouse, Mr J. Wilson (28); Kilmaurs, Mr D. McNaught (28); Parish of Kilwinning—Auchentiber, Mr H. Paterson (30); Eglinton District, Mr R. Brothertone (30); Kilwinning, Mr W. Blair (30); Parish of Kirkmichael—Kirkmichael, Mr J. Kirkland (31); Parish of Kirkoswald—Townhead, Mr T. Chapel (31); Parish of Largs—Fairlie, Mr H. Allan (23); Parish of Loudoun—Newmilns, Mr A. Hood (28); Parish of Mauchline—Crosshands, Miss C. Mitchell (26); Mauchline, Mr J. Campbell (26); Parish of Maybole and Maybole West Church—Cairn, Mr A. M. Nisbet (31); Ladyland, Mr J. S. Porteous (31); Minishant, Mr J. Clark (31); Parish of Monkton and Prestwick—Monkton, Mr Jas. Howat (26); Prestwick, Mr W. Beaton (26); Parish of Muirkirk—Glenbuck, Mr J. Rodger (26); Wellwood, Miss Bella Ross (26); Parish of New Cumnock—Beoch Side, Miss McLennan (36); Dalleagles, Mr A. H. Mackay (36); New Cumnock, Mr J. A. Wales (36); New Cumnock, R. C., Miss M. Connolly (36); Parish of Ochiltree—Ochiltree, Mr A. Andrew (26); Sinclairston, Mr A. Green (26); Parish of Old Cumnock—Garallan, Mr J. B. Wilson (26); Old Cumnock, Mr J. Dick (26); Skares, Miss J. Wilson (26); Old Cumnock, R. C., ? (26); Parish of Riccarton—Hurlford, Mr H. Andrew (28); Riccarton, Mr A. Inglis (28); Barleith, Miss I. Paterson (28); Parish of St Quivox—St Quivox, Mr A. Moody (26); Parish of Sorn—Auchencloigh, Miss Forrester (26); Catrine, Mr J. Monie (26); Sorn, Mr Ed. Robertson (26); Parish of Stair—Stair, Mr T. E. Scott (26); Parish of Stevenston—Kyles Hill, Mr Geo. Tait (29); Stevenston, Mr J. Taylor (29); Ardeer, Mr W. Reid (29); Parish of Stewarton—Kingsford, Mr W. Hastings (30); Stewarton, Mr A. L. Watt (30); Parish of Straiton—Loch Doon, Mr A. H. Campbell (31); Straiton, Mr W. MacMorland (31); Parish of Symington—Symington, Mr Jas. Currie (26); Parish of Tarbolton—Annbank, Mr J. McArthur (26); Parish of West Kilbride—West Kilbride, Mr J. G. Lyon (23).

COUNTY OF BANFF.

Parish of Aberlour—Aberlour, Mr W. Philip (90); Edenvillie, Mr D. R. Mackay (90); Craigellachie, Miss E. H. McWilliam (90); Parish of Alvah—Alvah, Mr A. Stuart (86); Dunlugas, Miss C. Simpson (86); Linhead, Mr J. H. Fraser (86); Burgh of Banff—Academy, Mr McPherson (85); St Andrew's Epis., Miss I. Marr (85); Parish of Banff (Landward)—Headrooms, Miss Adamson (85); Hilton, Mr A. Scott (85); Parish of Boharm—Boharm, Mr R. Grant (90); Forgie, Miss M. Gill (90); Maggyknockater, Mr T. M. Smith (90); Parish of Botriphnie—Botriphnie, Mr J. Innes (87); Parish of Boyndie—Blairmaud, Miss A. Adamson (85); Boyndie, Mr W. Ledingham (85); Whitehills, Mr Geo. Wilson (85); Parish of Cabrach—Lower, Mr T. Robertson (87); Upper, Mr J. S. Burns (87); Parish of Cullen—Cullen, Mr W. Cramond (85); Parish of Deskford—Deskford, Mr W. Smith (86); Parish of Enzie—Enzie, Mr W. F. Nichol (87); Port Gordon, Mr J. Reid (87); Parish of Fordyce

—Bogmuchals, Miss I. D. Craik (85); Brodiesord, Mr J. A. King (85); Fordyce Academy, Mr A. Emslie (85); Portsoy, ? (85); Sandend, Mr Henry Cumming (85); Portsoy Female Industrial, Miss Liddell (85); Parish of Gamrie—Longmanhill, Mr J. Carine (85); Macduff, Mr D. Renton (85); Macduff Murray's, Mr J. Panton (85); Parish of Glenrinnes—Glenrinnes, Mr S. Wilson (90); Parish of Grange—Grange, Mr J. D. Burns (87); Parish of Inveravon—Glenlivet, Mr T. Laing (91); Inveravon, Mr A. Myron (91); Morinish, Mr D. M. MacDonald (91); Tomnavoulin, Miss M. A. Henderson (91); Ballindalloch, Lady McPherson Grant's, Miss E. S. Myron (91); Tombae, St Mary's, R. C., Miss A. Gordon (91); Parish of Inverkeithney—Easterfield, Miss Jessie Galt (87); Kirktown, Mr J. E. Taylor (87); Parish of Keith—Achanachie, Miss J. A. Henderson (87); Fife Keith, Infant, Miss J. L. Anderson (87); Keith, ? (87); Tarry Croys, Miss M. S. Robertson (87); The Glen, Miss J. Crane (87); Newmill, Mr A. Johnstone (87); Parish of Kirkmichael—Kirkmichael, Miss M. Gordon (91); Parish of Marnoch—Aberchirder, Mr D. Stewart (86); Culvie, Mr J. McIvor (86); Marnoch, Mr W. C. Shand (86); Netherdale, Miss J. Merson (86); Aberchirder Epis., Mr Morgan (86); Parish of Mortlach—Mortlach, ? (90); Parish of Ordiquhill—Ordiquhill, Mr A. Donald (86); Cornhill, Mrs J. M. Kemp (86); Parish of Rathven—Arradoul, Miss E. Johini (85); Buckie, Mr A. Muir (85); Findochty, M. J. Geddes (85); Rathven, Mr J. S. Paterson (85); Buckie, Lady Cathcart's Indust., Miss J. Cocker (85); Parish of Rothiemay—Rothiemay, Mr J. Geddes (87); Ternemny, Mr J. Mackie (87).

COUNTY OF BERWICK.

Parish of Abbey St Bathan's—Abbey St Bathan's, Mr E. J. Wilson (42); Parish of Ayton—Burnmouth, Mr C. M. Alexander (42); Parish of Bunkle and Preston—Preston, Miss Robertson (42); Parish of Channelkirk—Channelkirk, Mr H. M. Liddell (42); Parish of Chirnside—Chirnside, Mr R. Kincaird (42); Parish of Cockburnspath—Ecclaw, Miss Nicholson (42); Parish of Coldingham—Auchincrow, Mr R. Greig (42); Cairnbank, Mr Harris (42); Coldingham, Mr W. Robb (42); Renton, Mr James Greig (42); Reston, Mr W. Dand (42); St Abbs, Mr A. Gibson (42); Parish of Coldstream—Coldstream, Mr D. C. Hardie (42); Parish of Cranshaws—Cranshaws, Mr W. B. Tomison (42); Parish of Duns—Millburn, Mrs E. S. Hopper (42); Parish of Earlston—Mellerstain, Miss A. Shaw (42); Parish of Eccles—Eccles, Mr W. Leitch (42); Parish of Edrom—Allanton, Mr Thomas Anderson (42); Parish of Foulden—Foulden, Mr C. Millar (42); Parish of Gordon—Gordon, Mr J. Leitch (42); Parish of Hume and Stitchell—Hume, Mr A. H. Cuthbert (42); Stitchell, Mr Wm. Smith (42); Parish of Hutton—Hutton, Mr John Brown (42); Paxton, Mr J. Kinross (42); Parish of Ladykirk—Ladykirk, Mr W. Milne (42); Parish of Langton—Langton, Mr J. McDonald (42); Parish of Lauder—Lauder, Mr W. Moore (42); Parish of Legerwood—Legerwood, Mr R. Martin (42); Parish of Longformacus—Longformacus, Mr J. Brown (42); Parish of Mertoun—Mertoun, Mr James Dodds (39); Parish of Mordington—Mordington, Mr Sinclair (42); Parish of Nenthorn—Nenthorn, Mr A. Winton (42); Parish of Polwarth—Polwarth, Mr R. Johnstone (42); Parish of Swinton—Swinton, Mrs Kayne (42); Parish of Westruther—Gateside, Miss C. Harrower (42); Westruther, Mr W. Gibb (42); Parish of Whitsome—Whitsome, Mr A. Brown (42).

COUNTY OF BUTE.

Parish of Cumbrae—Cumbrae, Mr R. Paterson (104); Parish of Kilbride—Brodick, Mr T. Reid (103); Corrie, Mr A. Cameron (103); Lamlash, Mr H. Wilkie (103); Parish of Kilmory—Littlemill, Mr J. D. McKinnon (103); Shiskine, Mr R. T. Irvine (103); Sliddery, Mr J. A. Cook (103); Parish of Kingarth—Birgidale, Miss M. S. Stewart (104); Kerrycroy, Mr W. Fulton (104); Kingarth, Mr W. T. Esplin (104); Mount Stewart, R. C., Mr J. Linsley (104); Parish of North Bute—Ballianlay, Mr J. Duncan (104); Kildavannan, Mrs G. Weir (104); North Bute, Mr P. White (104); Burgh of Rothesay—Academy and Thomson's Institut., Mr J. D. Rose (104); Rothesay, Mr J. McKay (104); St Andrews, R. C., Sister Colette (104).

COUNTY OF CAITHNESS.

Parish of Bower—Bower, Mr D. Crowe (98); Gillock, Miss Bain (98); Stanstill, Mr A. Henry (98); Stemster, Mr J. Watson (98); Parish of Canisbay—Canisbay, Mr A. Munro (97); Freswick, Mr A. R. Forrest (97); John O'Groats, Mr G. F. Mackenzie (97); Mey, Mr Neil J. Leitch (97); Stroma, Mr D. Cormack (97); Parish of Dunnet—Crossroads, Mr W. A. Fowler (98); Dunnet, Mr A. Hay (98); Greenland, Miss M. A. Sutherland (98); Parish of Halkirk—Banniskirk, Miss G. Sinclair (98); Calder, Mr G. Sutherland (98); Harpsdale, Miss J. Noble (98); Leurery, Mr J. McKenzie (98); Spittal, Mr R. A. Morgan (98); Parish of Keiss—Aukengill, Mr G. Stalker (97); Parish of Latheron—Bruan, Mr J. Sutherland (97); Dunbeath, Mr J. Morrison (97); Lybster, Mr J. Mackenzie (97); Wheel, Miss E. M. Ross (97); Parish of Olrig—Castletown, Mr A. S. Robertson (98); Durran, Miss K. M. Cameron (98); Murkle, Mr J. Weir (98); Tain District, Miss J. Coghill (98); Olrig Female, Miss D. Sutherland (98); Parish of Reay—Brubster, Mr D. McLeod (98); Reay, Mr D. Menzies (98); Parish of Thurso—Forss, Mr W. Thom (98); Janetstown Dist., Miss J. Cormack (98); Miller Instit., Mr W. McLaren (98); West, ? (98); Weydale Dist., Mr A. Killin (98); Parish of Watten—Gersa, Mr A. Sutherland (98); Lanergill, Mr A. Malloch (98); West Watten, Mr P. Sutherland (98); Burgh of Wick—Pulteneytown Academy, Mr W. Dick (97); Wick North, Mr Geo. Gunn (97); Wick South, Mr A. S. Fullarton (97); West Banks, Mr C. Fletcher (97); Parish of Wick (Landward)—Bilbster, Mr C. MacLennan (97); Staxigoe, Mr Geo. Sutherland (97); Tannach, Mr J. T. Robison (97); Thrumster, Mr D. Finlayson (97); Whaligoe, Miss C. Sutherland (97).

COUNTY OF CLACKMANNAN.

Parish of Alloa Town—Alloa Burgh, Mr A. Wilson (51); Ludgate, Mr W. Millar (51); Sunnyside, Mr Ferguson (51); Alloa Epis., Mr M. H. Locker (51); Parish of Alloa (Landward)—Sauchie, Mr J. W. Paterson (51); Parish of Alva—Alva, Infant, Miss M. J. Lodge (51); Parish of Clackmannan—Clackmannan, Mr J. R. Renton (51); Forestmill, Miss Anderson (51); Kennet, Miss M. S. Aitchison (51); Parish of Dollar—Dollar, Mr J. Begg (51); Parish of Tillicoultry—Coalsnaughton, Mr J. Hunter (51); Tillicoultry, Mr J. Wilson (51).

COUNTY OF DUMBARTON.

Parish of Arrochar—Ardlui, Miss Lumsden (101); Arrochar, Mr C. Grierson (101); Parish of Bonhill—Alexandria, Main St, Mr A. F. Campbell (105); Vale of Leven Academy, Mr D. Macintyre (105); Bonhill, Mr A. K. Edward (105); South Jamestown, Mr D. R. Balls (105); Parish of Cardross—Cardross, ? (105); Renton, Mr J. Andren (105); Parish of Cumbernauld—Cumbernauld, Mr D. McPhie (10); Southern District, Miss E. McPhie (10); Burgh of Dumbarton—Academy, Mr A. T. Watson (106); Knoxland, ? (106); West Bridgend, Mr W. D. Anderson (106); Parish of Kilmaronock—Ardoch Bridge, Miss J. Forbes (105); Kilmaronock, Mr Lang (105); Parish of Kirkintilloch—Lenzie Academy, Mr A. Buchanan (12); Townhead, Mr D. Cameron (12); Parish of Kirkintilloch (Landward)—Condorrat, Mr W. Kerr (12); Tweechar, Mr J. Smith (12); Parish of Luss—Luss, Mr A. Forsyth (105); Muirland, Miss J. B. Cunningham (105); Parish of East Kilpatrick—Craigton, Mr D. Lindsay (19); Temple, Mr. J. Scott (19); Parish of West Kilpatrick—Clydebank, ? (22); Duntocher, ? (22); Milton, Mr G. Jennings (22); Parish of Roseneath—Roseneath, Mr W. Stewart (105); Parish of Row—Garelochhead, Mr J. Connor (105); Glenfruin, Miss M. A. Grant (105); Helensburgh, Grant and James St, Mr J. A. Crabbe (105); Helensburgh Hermitage, Mr D. Buchanan (105); Row, Mr W. Fraser (105); Shandon, Miss A. S. Connor (105); Helensburgh, Trinity Episc., Mr A. J. Bailey (105).

COUNTY OF DUMFRIES.

Parish of Annan—Academy, Mr W. Duncan (37); Annan, Mr W. Howe (37); Breconbeds, Mr J. Donaldson (37); Parish of Applegarth and Sibbaldbie—Sandyholm, Mr James Scott (37); Sibbaldbie, Mr G. Nettleship (37); Parish of Brydekirk—Brydekirk, Mr W. Thorburn (37); Parish of Canonbie—Gilnockie, Mr J. Hannam (37); Glenzier, Mr W. Guthrie (37); Harlaw, Mr W. G. Robertson (37); Parish of Caerlaverock—Glencaple, Mr W. Alexander (35); Parish of Closeburn—Closeburn, Miss Somerville (36); Gubhill, Mr Ja. Riddick (36); Wallace Hall Academy, Mr H. F. Menzies (36); Parish of Cummertrees—Trailtrow, Mr Wm. J. Rae (35); Parish of Dalton—Dalton, Mr A. Galbraith (37); Parish of Dornock—Dornock, Mr J. Dunlop (37); Parish of Dryfesdale—Lockerbie Academy, Mr P. Malcolm (37); Burgh of Dumfries—George Street, Mr J. Douglas (35); Loreburn Street, Mr J. B. Waddell (35); St Michael's Street, Mr J. Hendrie (35); St Andrew's, R. C., Mr J. Burns (35); St John's Episcopal, Mr L. G. MacDonald (35); Parish of Dumfries (Landward)—Brownhall, Mr J. White (35); Catherinefield, Mr D. H. Hutcheon (35); Noblehill, Mr T. Laing (35); Parish of Dunscore—Burnhead, Mr J. Dickson (36); Dunscore Village, Mr D. Gold (36); Parish of Durrisdeer—Birleyhill, Mr J. Connell (36); Durrisdeer, Mr J. R. Boyle (36); Enterkinfoot, Miss Dobson (36); Parish of Eskdalemuir—Davington, Mr E. H. Scott (37); Parish of Ewes—Ewes, Mr J. Lyall (37); Parish of Glencairn—Craigmuie, Miss E. Anderson (36); Moniaive, Mr K. Hunter (36); Parish of Gretna—Gretna, Mr James McIndoe (37); Mount Pleasant, Mr A. S. Farquhar (37); Parish of Hoddam—Hoddam, Mr A. Fairnie (37); Parish of Holywood—Holywood, Mr W. Kennedy (36); Speddoch, Miss Bell (36); Steilston, Mr John Kennedy (36); Parish of Hutton and Corrie—Corrie, Mr T. McLuskie (37); Hutton, Mr J. B. Edgar (37); Parish of Johnstone—Cogrieburn, Mr D. Angus (37); Goodhope, Mr J. Forsyth (37); Johnstone, Mr T. Craig (37); Parish of Keir—Lower, Mr J. R. Gordon (36); Upper, Mr J. B. Soutar (36); Parish of Kirkconnel—Cairn Combination, Mr J. Love (36); Parish of Kirkmahoe—Dalswinton, Mr T. Byers (36); Parish of Kirkmichael—Garrel, Mr R. K. Howie (37); Nethermill, Mr W. Hair (37); Parish of Kirkpatrick Fleming—Gair, Mr W. Turnbull (37); Kirkpatrick Fleming, Mr C. F. Brown (37); Parish of Kirkpatrick Juxta—Dumgree, Mr J. Smith (37); Kirkpatrick Juxta, Mr A. W. Wright (37); Parish of Langholm—Langholm Academy, ? (37); Wauchope, Miss Janet Bell (37); Parish of Lochmaben—Hightae, Mr Jas. McGregor (37); Lochmaben, Mr J. D. Dean (37); Templand, Mr D. Paterson (37); Parish of Middlebie—Hottsbridge, Mr J. Campbell (37); Middlebie, Mr Wm. Kerr (37); Eaglesfield, Mr J. L. Boyle (37); Parish of Moffat—Academy, Mr J. Duncan (37); Annan Water, Mr A. Prosser (37); Evan Water, Mr D. G. C. Stewart (37); Moffat Water, Mr Pollock (37); Parish of Morton—Morton Infant, Miss C. McKay (36); Carronbridge, Duke of Buccleuch's, Mr D. Smart (36); Parish of Mouswald—Mouswald, Mr J. F. Young (35); Parish of Penpont—Penpont, Mr W. Laidlaw (36); Parish of St Mungo—St Mungo, Mr J. Paterson (37); Parish of Sanquhar—Sanquhar, Mr R. N. Carson (36); Mennoch Bridge, Duke of Buccleuch's, Miss K. Simpson (36); Wanlockhead, Mr J. Edmond (36); Parish of Tinwald—Amisfield, Mr F. Ellon (37); Shieldhill, Miss Mundell (37); Parish of Torthorwald—Collin, Mr J. Proudfoot (35); Torthorwald, Mr J. McDougall (35); Parish of Tundergarth—Tundergarth, Mr C. Wilson (37); Parish of Tynron—Tynron, Mr Wm. Gookin (36); Tynron Endowed, Mr J. Lawrie (36); Parish of Westerkirk—Megdale, Mr John Buchan (37); Westerkirk, Mr W. S. Irving (37).

COUNTY OF MIDLOTHIAN.

Parish of Borthwick—Borthwick, Mr J. J. H. Reid (47); Parish of Carrington—Carrington, Mr R. B. Brunton (47); Parish of Cockpen—Bonnyrigg, Mr A. Somerville (47); Cockpen, Miss C. Graham (47); Parish of Colinton—Colinton, Mr A. Robertson (46); Juniper Green—Inf. and Ind., Miss Davidson (46); Juniper Green, Mr Jas. Malloch (46); Slateford, Mr A. Peterson (46); Swanston, Miss Graham (46); Parish of Corstorphine—Corstorphine, Mr G.

McGowan (46); Parish of Cramond—Davidson's Mains, Mr W. Bannerman (46); Lennie, Mr R. B. Finlayson (46); Parish of Cranston—Cousland, Mr J. Simpson (47); Cranston, Mr G. J. D. Barnes (47); Parish of Crichton—Crichton, ? (47); Pathhead, St Mary's R. C., Miss Gibney (47); Parish of Currie—Balerno, ? (47); Currie, Mr J. Jarvie (47); Hermiston, Miss Houston (47); Parish of Dalkeith—King's Park, Mr P. Marshall (47); City of Edinburgh—Bristo, Mr J. Philip (44); Broughton, Mr A. Hutcheson (44); Bruntsfield, Mr J. King (44); Davie Street, Mr J. McCrindle (44); Dean, ? (44); Duddingston, Mr A. Millar (44); Flora Stevenson, Mr D. Gloag (44); Granton, Mr A. Scott (44); Leith Walk, Mr W. Alexander (44); London Street, Mr A. Shennan (44); North Canongate, Mr A. Young (44); North Merchiston, Mr A. H. Taylor (44); Parsons Green, Mr Williamson (44); Portobello, ? (44); Portobello, Tower Bank, Mr R. Todd (44); St Bernard's, Mr W. Mackay (44); South Bridge, ? (44); South Morningside, Mr J. Watson (44); Warrender Park, Mr Jas. Andrew (44); West Fountainbridge, Mr A. J. Johnston (44); Abbeyhill Epis., Miss Mackie (44); All Saints' Epis., Mr H. Hunter (44); Deaf and Dumb Institute, Mr E. Illingworth (44); Practising Epis., Mr W. L. Rayner (44); St Andrew's Epis., Mrs M. E. Morison (44); St James' Epis., ? (44); Parish of Fala and Soutra—Fala and Soutra, Mr J. Duncan (47); Parish of Glencorse—Glencorse, Mr A. G. Bertram (47); Parish of Heriot—Heriot, Mr W. Weir (47); Parish of Inveresk (Landward)—Cowpits, Miss Dunn (46); Craighall, Miss Brown (46); Wallyford, Miss Allan (46); Parish of Kirknewton and East Calder—East Calder, Mr J. Black (47); Kirknewton, Mr T. Dick (47); Oakbank, Mr W. Millar (47); Parish of Lasswade—Lasswade, Mr James Gall (47); Loanhead, Mr R. M. Mackinnon (47); Pentland, Mr T. L. Lee (47); Rosewell, Mr D. Nelson (47); Roslin, Mr E. A. White (47); Loanhead St Margaret's, R. C., Mr M. Macintosh (47); Parish of Leith (Burgh)—Academy, Mr J. W. Tait (45); Bonnington Road, ? (45); Couper Street, Mr W. Darling (45); Great Junction Street, ? (45); Links Place, ? (45); Lochend Road, Mr R. Donaldson (45); Lorne Street, ? (45); Newhaven, Victoria, Mr R. B. Scott (45); North Fort Street, Mr J. Fraser (45); St Thomas, Mr J. Morgan (45); Trinity Academy, Mr T. M. Duncan (45); Yardheads, Mr T. Fraser (45); St James' Epis., Mr W. F. Walker (45); Parish of Liberton—Burdiehouse, Mr R. H. Tait (46); Gilmerton, Mr Montgomery (46); Liberton, Mr Thomas Custon (46); New Craighall, Miss A. M. Comrie (46); Gilmerton, The Anderson Female Industrial, Miss Stewart (46); Parish of Mid-Calder—Bellsquarry, Mr Shields (47); Causewayend, Miss Rutherford (47); Burgh of Musselburgh—Grammar, Mr Hope (46); Fisherrow Burgh, Mr J. W. Stephen (46); St Peter's Epis., Mr Stone (46); Parish of Newbattle—East Houses, Mr M. B. Trail (47); Parish of Penicuik—Howgate, Mr Jas. Downs (47); Kirkhill, ? (47); Penicuik Epis., Miss Annand (47); Parish of Ratho—Ratho, Mr T. Heslop (46); Dalmahoy, St Mary's Epis., Mr Pullan (46); Parish of Stobhill—Stobhill, Mr J. Hastie (47); Parish of Temple—Temple, Miss G. S. Lauder (47); Toxside, Mrs Cook (47); Parish of West Calder—Gavieside, Mr J. H. Taylor (47); Harburn, Miss Anderson (47); Leavenseat, Mr A. McIntosh (47); Woodmuir, Mr J. Graham (47).

COUNTY OF ELGIN.

Parish of Alves—Alves, Mr J. D. Cheyne (89); Parish of Bellie—Bellie, Mr A. J. Adams (88); Fochabers Milne's Institute, ? (88); Parish of Birnie—Birnie, Mr A. Murray (90); Parish of Cromdale—Advie, Mr W. T. Norval (91); Cromdale, Mr James Slater (91); Dava, Miss Jean Peace (91); Parish of Dallas—Kellas, Miss M. Clark (90); Parish of Drainie—Drainie, Mr J. McDonald (88); Lossiemouth, Mr A. S. Melvin (88); Parish of Duffus—Burghead, Mr J. Bremner (89); Duffus, Mr J. W. Corrigal (89); Roseisle, Miss H. Cowper (89); Parish of Dyke—Dyke, Mr J. J. Burgess (89); Kintessack, Miss Russell (89); Parish of Edinkillie—Conicavel, Mr J. McColl (90); Logie, Mr W. Russell (90); Relugas, Miss F. Maclennan (90); Burgh of Elgin—Bishopmill, Mr G. Sutherland (88); Elgin, Girls, Miss Stephen (88); West End, Mr P.

Dow (88); Parish of Elgin (Landward)—Mosstowie, Mr W. Scott (88); New Elgin, Mr J. S. Turner (88); Parish of Kinloss—Findhorn, Mr J. Dewar (89); Kinloss, Mr J. Stewart (89); Parish of Knockando—Elchies, Mr J. Milne (90); Knockando, Mr C. Watt (90); Archiestown, Miss C. M. Turner (90); Parish of New Spynie—New Spynie, Mr J. Thomson (88); Parish of Rafford—Burgie, Miss A. Jeffrey (90); Parish of Rothes—Rothes, Mr T. R. Watson (90); Parish of St Andrews Lhanbryde—Cranloch, Mr W. T. Melvin (88); St Andrews Lhanbryde, Mr R. Stephen (88); Parish of Speymouth—Garmouth, Mr W. F. Stewart (88); Speymouth, Mr A. Geddie (88); Parish of Urquhart—Urquhart, Mr A. Ritchie (88).

COUNTY OF FIFE.

Parish of Abdie—Abdie, Mr A. Lornie (55); Parish of Aberdour—Aberdour, Mr R. Young (53); Donibristle Colliery, Mr P. Williamson (53); Parish of Anstruther Easter—Anstruther Easter, Mr J. Paterson (55); Parish of Anstruther Wester—Anstruther Wester, Mr W. P. Wilson (54); Parish of Auchterderran—Auchterderran, Mr A. Rankine (53); Cardenden, Mr T. A. McEwen (53); Parish of Auchtermuchty—Dunshalt, Miss Melville (57); Parish of Auchtertool—Auchtertool, Mr J. Glendinning (53); Parish of Ballingry—Ballingry, Mr J. Park (57); Parish of Balmerino—Balmerino, Mr T. Barrie (55); Parish of Beath—Cowdenbeath, ? (57); Foulford, Mr W. A. Guthrie (57); Hill of Beath, ? (57); Kelty, Mr James B. Calder (57); Parish of Burntisland—Burntisland Episcopal, Miss J. Stewart (53); Parish of Cameron—Cameron, Mr J. Robertson (55); Denhead, Miss B. McGillivray (55); Radernie, Mr W. Wilson (55); Parish of Carnbee—Arncroach, Mr J. Donaldson (55); Carnbee, Mr J. Pentland Smith (55); Parish of Carnock—Cairney Hill, Mr J. B. Rankine (52); Parish of Collessie—Collessie, Mr W. Penman (57); Ladybank, Mr T. H. Ross (57); Parish of Crail—Crail, Mr M. Ireland (55); Parish of Culross—Geddes, Mr J. Ramsay (52); Parish of Cults—Cults, Mr G. L. Leitch (55); Parish of Cupar (Landward)—Brighton, Miss J. C. Cumming (55); Parish of Dairsie—Dairsie, Mr W. S. Seath (55); Parish of Dalgety—Hillend, Mr J. Forrester (53); Parish of Dunbog—Dunbog, Mr J. Anderson (55); Parish of Dunfermline (Burgh)—McLean, Mr C. McChlery (52); Milesmark, Mr W. Hepburn (52); Queen Anne, ? (52); St Leonards, ? (52); Parish of Dunfermline (Landward)—Charlestown, Mr J. Davidson (52); Crossford, Mr A. Borthwick (52); Crossgates, Mr R. Wallace (52); Halbeath, Mr J. Robertson (52); Limekilns, Mr A. Todd (52); Townhill, Mr J. Marshall (52); Wellwood, Mr G. Henderson (52); Parish of Dunino—Dunino, Mr J. W. Somers (55); Parish of Dysart (Burgh)—Dysart, Mr John Boyd (54); Parish of Elie—Elie, Mr R. Crombie (55); Parish of Falkland—Falkland, Mr J. Richardson (57); Freuchie, Mr J. Methven (57); Parish of Flisk—Flisk, Mr D. M. Dingwall (55); Parish of Forgan—Forgan, Mr J. Cameron (55); Wormit, Mr D. M. Allison (55); Parish of Inverkeithing—Inverkeithing, Mr D. M. Scott (53); North Queensferry, Mr J. M. Cuthill (53); Parish of Kennoway—Kennoway, Mr James Blair (54); Star, Mr W. McLachlan (54); Parish of Kettle—Kettle, Miss Lawson (57); Parish of Kilconquhar—Colinsburgh, Mr J. H. Balleny (55); Kilconquhar, Mr D. L. Pye (55); Parish of Kilmany—Kilmany, Female, Miss White (55); Parish of Kilrenny—Cellardyke, Mr J. Barbour (55); Kilrenny Upper, Mr R. Forsyth (55); Parish of Kinghorn—Kinghorn, Mr W. Mann (53); Kinghorn, Infant, Miss Gibson (53); Parish of Kinglassie—Kinglassie, Mr W. Spears (54); Parish of Kingsbarns—Kingsbarns, Mr R. McKenzie (55); Parish of Kirkcaldy—Abbotshall, Mr J. Ogilvie (58); East, Mr W. Watson (58); High (Elem. Dept.), Mr J. Corrie (58); Parish of Kirkcaldy and Dysart (Landward)—Chapel, Mr G. Harris (54); Strathore, Mr D. T. Brunton (54); Parish of Largo—Durham, Miss Riach (54); Kirkton, Mr T. Nicholl (54); Lundin Mill, Mr D. M. Stewart (54); Parish of Largoward—New Gilston, Mr J. Inch (55); Parish of Leslie—Leslie, Mr D. McLeod (57); Parish of Leuchars—Balmullo, Mr D. Murrie (55); Guardbridge, Mr R. Anderson (55); Leuchars, Mr J. Cribbes (55); Parish of Lochgelly—Lochgelly, Mr P. MacDuff (53); Lumphinnans, Mr D. Low (53); Parish of Markinch—Balcurvie, Mr A. Coutts (54); Coaltown, Mr A. S. Coutts (54); Markinch, Mr D. G. Coull (54); Preston, Mr James Munro

(54); Parish of Monimail—Easter Fernie, Mr C. Arnott (55); Letham, Mr C. D. Smitton (55); Parish of Moonzie—Moonzie, Mr J. Douglas (55); Parish of Newburgh—Newburgh, Mr John Howat (55); Parish of Newburn—Newburn, Mr F. R. Lumsden (55); Parish of Pittenweem—East, Mr A. Howat (55); South, Miss Watson (55); Parish of St Andrews (Burgh)—Burgh, Mr E. King (55); Parish of St Andrews (Landward)—Boarhills, Mr T. S. Glover (55); Parish of St Monance—St Monance, Mr Isaac Neirn (55); Parish of Scoonie—Smithy Green, Miss Ferrier (54); Parish of Springfield—Springfield, Mr J. Forbes (57); Parish of Strathmiglo—Gateside, Mr Duff (57); Strathmiglo, Mr G. Braid (57); Parish of Wemyss—Wemyss, Dorothy, Mr D. H. Lindsay (54).

COUNTY OF FORFAR.

Parish of Aberlemno—Aberlemno, Mr J. Stewart (73); Pitkennedy, Mr W. Irvine (73); Parish of Airlie—Airlie, Mr W. Lyon (68); Parish of Arbirlot—Arbirlot, Mr Wilson (65); Parish of Auchterhouse—Auchterhouse, Mr J. Robertson (68); Burgh of Arbroath—High (Elem. Dept.), Miss M. Duguid (64); Inverbrothock, Mr A. F. Davidson (64); Keptie, Mr J. Kinnear (64); The Abbey, Mr J. Hunter (64); The Hill, Mr J. Guild (64); Parish of Barry—Barry, Mr D. Bain (65); Carnoustie, Mr D. A. Christie (65); Burgh of Brechin—Bank Street, Mr J. D. Ross (73); The Tenements, Mr R. A. Scott (73); Parish of Brechin (Landward)—Aldbar, Mr A. C. Robertson (73); Little Brechin, Mr C. Richard (73); Arrat, Miss J. H. Westwood (73); Town of Broughty Ferry—Eastern, Mr Wm. Sim (65); Grove Academy, Mr Alex. Hutt (65); Southern, Mr R. Cameron (65); Western, Mr J. Thomson (65); Parish of Careston—Careston, ? (73); Parish of Carmyllie—East, Mr G. S. McDonald (67); West, Mr W. F. Anderson (67); Parish of Craig—Ferryden, Infant, Miss J. Coull (72); Westerton, Mrs J. Wilkie (72); Parish of Cortachy and Clova—Clova, Mr G. Cameron (75); Glenprosen, Mr R. H. Volume (75); Wateresk, Mr T. Campbell (75); Burgh of Dundee—Ancrum Road, Mr R. Locke (66); Ann Street, Mr J. Gibson (66); Balfour Street, Mr W. Bertie (66); Blackness, Mr J. Malloch (66); Brown Street, Mr C. Sharp (66); Butterburn, Mr J. A. Anderson (66); Cowgate, Mr G. Sword (66); Dudhope, Mr G. Simpson (66); Glebelands, Mr J. Mudie (66); Harris Academy, Mr J. Brebner (66); Hill St, Mr G. Ferguson (66); Lochee, Liff Road, Mr R. W. Thornton (66); do., South Road, Mr A. Dorward (66); Morgan Academy, Mr W. B. Irvine (66); Rosebank, Mr W. Dickson (66); St Andrew's, Mr A. Leighton (66); Tay St, Mr D. Dawson (66); Victoria Road, Mr R. Loggie (66); Wallace Town, Mr J. Watt (66); Lochee Epis., Mr A. Marr (66); St Martin's Epis., Miss Gibb (66); St Paul's Epis., Mr W. Gray (66); Lochee, St Mary's, R. C., Mr R. A. Smith (66); St Patrick's, R. C., Miss McErlain (66); Seafield's Works, Half time, Miss Roy (66); Parish of Dundee (Landward)—Drumgeith, Mr J. Keith (66); Parish of Dunnichen—Craichie, Mr H. S. Deas (67); Letham, Mr T. M. Henry (67); Parish of Eassie and Nevay—Eassie and Nevay, Mr A. Mearns (68); Parish of Edzell—Edzell, Mr T. Bennet (75); Waterside, Miss J. Black (75); Parish of Fern—Fern, Mr J. Miller (75); Burgh of Forfar—West, Mr J. Campbell (67); Parish of Forfar (Landward)—Lunanhead, Mr J. Yuille (67); Parish of Fowlis Easter—Fowlis Easter, Mr G. Colston (68); Parish of Glamis—Glen Ogilvy, The Milton, Mr Henderson (67); Parish of Glenisla—Folda, Mr T. D. Lyon (76); Glenisla, Mr R. Thomson (76); Kilry, Mr J. C. Beaton (76); Parish of Guthrie—Guthrie, Mr J. Smith (73); Parish of Inverarity—Inverarity, Mr P. Elder (67); Parish of Inverkeilor—Chapelton, Mr W. Linton (65); Inverkeilor, Mr Chas. Crawford (65); Parish of Kettins—Kettins, Mr D. Macqueen (68); Parish of Kinnell—Kinnell, Mr W. Gouldie (72); Parish of Kinnettles—Kinnettles, Mr G. Marten (67); Parish of Kirkden—Kirkden, Mr Lee (67); Parish of Kirriemuir—Carroch, Mr S. J. Welch (75); Kirriemuir Evening School, Mr G. Kyd (75); Padanarum, Mr D. W. Fairweather (75); Reform St, Mr A. Phyn (75); Roundyhill, Mr T. Hewit (75); Webster's Seminary, Mr A. Menzies (75); Westmuir, Miss F. A. Hood (75); St Mary's Epis., Mr H. E. Peacock (75); Parish of Liff, Benvie, etc.—Liff, Mr A. McCaskie (68); Muirhead of Liff, Mr J. B. Dorward (68); Parish of Lintrathen—Braes of Coull, Mr J. Cook (76); Lintrathen, Mr W. F. Anderson (76); Parish of Lochlee—

Lochlee, Mr S. Cruickshank (75); Parish of Logie Pert—Craigo, Mr J. Eaton (73); Parish of Lunan—Lunan, Mr Arch^{d}. Wilson (72); Parish of Lundie—Lundie, Mr J. Scott (68); Parish of Mains and Strathmartine—Downfield, Mr W. Eckford (68); Strathmartine, Mr J. M^{c}Ash (68); Parish of Maryton—Maryton, Miss Mary Kelman (72); Parish of Menmuir—Menmuir, Mr R. Grimm (73); Parish of Monifieth—Monifieth, Mr J. H. Meldrum (65); Parish of Monikie—Bankhead, Mr A. Clark (67); Monikie, Mr P. Grant (67); Newbigging, Mr S. S. Low (67); Burgh of Montrose—Academy, Mr A. J. A. Russell (72); Southesk, Mr J. Stobo (72); Parish of Murroes—Murroes, Mr H. A. Forsyth (67); Parish of Navar and Lethnot—Navar and Lethnot, Mr W. Paterson (75); Parish of Newtyle—Newtyle, Mr Morgan (68); Parish of Oathlaw—Oathlaw, Mr M. A. Thomson (75); Parish of Panbride—Muirdrum, Mrs Nicolls (65); Panbride, Mr J. C. Stuart (65); Parish of Rescobie—Rescobie, Mr W. Simpson (73); Parish of St Vigeans and Arbroath (Landward)—Colliston, Mr R. S. Armit (65); St Vigeans, Mr Jas. Cox (65); Parish of Tannadice—Burnside of Inshewan, Mr W. Mortimer (75); Tannadice, Mr J. Henderson (75); Parish of Tealing—Tealing, Mr P. M. M^{c}Kenzie (68).

COUNTY OF HADDINGTON.

Parish of Aberlady—Aberlady, Mr A. M. Jameson (43); Parish of Bolton—Bolton, Mr A. T. Nicol (43); Parish of Dirleton—Kingston, Mr J. Aitchison (43); Dunbar (Burgh)—Dunbar, Mr A. Caurie (43); Parish of Dunbar (Landward)—East Barns, Mr A. M^{c}Callum (43); Parish of Garvald—Garvald, Mr J. Boucher (43); Parish of Gladsmuir—Longniddry, Mr J. G. Allan (43); Samuelston, Mr J. Winton (43); Haddington Burgh—Primary, ? (43); Roman Catholic, Miss English (43); Parish of Innerwick—Innerwick, Mr P. Purdie (43); Parish of Morham—Morham, Mr W. Graham (43); Parish of North Berwick—Halfland Barns, Miss I. O. Brown (43); High (Elementary Department), Mr T. S. Glover (43); North Berwick, Mr G. Tait (43); Parish of Ormiston—Crossroads, Mr Chalmers (43); Ormiston, Mr R. Henderson (43); Parish of Pencaitland—Pencaitland, Mr C. A. Ritchie (43); Parish of Prestonpans—Prestonpans, Mr J. Wallace (43); Parish of Salton—Salton, Mr W. A. Findlay (43); Parish of Spott—Spott, Mr R. Grieve (43); Parish of Stenton—Stenton, Mr J. Brown (43); Parish of Whitekirk and Tyninghame—Tyninghame, Mr R. A. Watt (43); Whitekirk, Mr J. Wood (43); Parish of Whittinghame—Kingside Combination, Miss Hutchison (43); Whittinghame, Mr J. Hunter (43); Parish of Yester—Longyester, Miss E. Muir (43); Yester, ? (43).

COUNTY OF INVERNESS.

Parish of Abernethy and Kincardine—Abernethy, Mr A. Steele (91); Dorback, Miss A. Cruickshank (91); Glenbrown and Glenlochy, Miss H. M^{c}Gregor (91); Tulloch, Mr G. Cumming (91); Parish of Alvie—Alvie, Mr F. Garden (91); Lagganlia, Miss M. M^{c}Lean (91); Lynwilg, Miss M. M^{c}Donald (91); Parish of Arisaig—Glenuig, Miss Mackay (100); Arisaig, R. C., Miss M. J. M^{c}Cartan (100); Parish of Barra—Castlebay, Mr J. Smith (107); Craigston, Mr C. W. Kelsey (107); Northbay, Mr P. Flanagan (107); Parish of Boleskine and Abertarff—Boleskine, Mr Wm. Traill (94); Fort Augustus, Mr J. D. Robertson (94); Knockchoilum, Miss I. Mackintosh (94); Parish of Bracadale—Carbost, Mr G. Barron (99); Glenbrittle, Miss D. M'Crimmon (99); Struan, Mr W. P. Gold (99); Parish of Croy and Dalcross—Clava, Mr J. Moir (89); Croy, Mr J. Wedderspoon (89); Parish of Daviot and Dunlichty—Brin, Mr J. Macrae (91); Daviot, Mr A. M^{c}Lellan (91); Dunmaglass, Miss J. Davidson (91); Farr, Mr J. G. M^{c}Beth (91); Parish of Dores—Aldourie, Mr M. M^{c}Donald (94); Stratherrick, Mr G. R. Wilson (94); Parish of Duirinish—Borraraig, Mr F. Nicolson (99); Borrodale, Mr J. M^{c}Kay (99); Colbost, Mr J. S. Young (99); Edinbain, Mr D. J. Mackenzie (99); Parish of Duthil and Rothiemurchus—Deshar, Mr J. Galbraith (91); Dulnain Bridge, Mr W. Stuart (91); Duthil, Mr J. Macrae (91); Rothiemurchus, Mr W. Dempster (91); Parish of Glenelg—Arnisdale, Miss M. Macdonald (99); Bracara, Miss C. F. Robertson (99); Glasnacardock, Mr T. O'Reilly

(99); Glenelg District, Mr J. McArthur (99); Parish of Glengarry—Aberchalder, Miss Macnab (94); Invergarry, Mr J. P. Graham (100); Glenquoich, Miss Durnie (100); Parish of Harris—Amhuinnsuidh, Mr J. MacLeod (108); Drinishader, Mr D. Mackinnon (108); Finsbay, Mr D. J. McRa (108); Kyles Stocknish, Mr M. Macarthur (108); Manish, Mr W. Cook (108); Scalpa, Mr J. L. Neil (108); Scarp, Mr D. Craig (108); Scarista, Miss M. Paterson (108); Parish of Insh—Insh, Miss E. W. Whyte (91); Inverness (Burgh)—Central, ? (92); Clachnaharry, Mr J. L. Clark (92); Farraline Park, Mr A. Thomson (92); High (Elementary Department), Mr T. Wallace (92); High (Secondary Department), Mr A. McBain (92); Cathedral, Boys, Mr Hy. Stafford (92); Northern Counties Blind Institution, Mr Anderson (92); Parish of Inverness (Landward)—Culduthel, Mr J. McPherson (92); Leachkin, Mr J. Tough (92); Nairnside, Mr Martin (92); Highland Orphanage, Miss C. A. Strachan (92); Parish of Kilmallie—Banavie, Mr J. Young (100); Fort William, Mr A. Mackay (100); Kinlocheil March, Mrs W. Fraser (100); Onich, Mr W. Hay (100); Fort William, R. C., Mr K. Mailley (100); Parish of Kilmonivaig—Roy Bridge, Miss M. Nesbit (100); Tomcharich, Miss R. Cameron (100); Parish of Kilmorack—Beauly, Mr J. Pollock (93); Struy, Mr D. Reid (93); Beauly, R. C., Miss L. McDonell (93); Marydale, R. C., Miss B. Carr (93); Parish of Kilmuir—Kilmaluag, Mr R. S. MacKay (99); Parish of Kiltarlity—Culburnie, Mr H. Henderson (94); Guisachan, Mr J. McPhail (94); Parish of Kingussie—Kingussie, ? (91); Newtonmore, ? (91); Parish of Kirkhill—Kirkton, Miss McGlashan (93); Knockbain, Mr J. Shewan (93); Parish of Laggan—Glentruim, Mr A. Douglas (91); Lochlaggan, Mr J. Livingstone (91); Parish of Moy and Dalarossie—Dalarossie, Mr S. Archibald (91); Moy, Mr J. Hunter (91); Raibeg, Mr D. Cameron (91); Parish of North Uist—Boreray, Mr F. Maclean (107); Claddach Kirkibost, Miss Matheson (107); Glaic, Miss M. McDonald (107); Grimisay, Mr D. Campbell (107); Heisker, Miss M. F. Mackay (107); Locheport, Miss J. M. I. Grant (107); Lochmaddy, Mr J. McDonald (107); Trumisgarry, Mr H. McDougall (107); Parish of Petty—East, Mr J. S. Gloag (89); West, Mr W. McCulloch (89); Parish of Portree—Braes, Mr J. Bruce (99); Glens, Mr R. Ramsay (99); Penefiler, Mr K. Macpherson (99); Portree, Mr A. Gillanders (99); Raasay, Mr H. Macfarlane (99); Rona, Mr A. Murchison (99); Torran, Mr T. Graham (99); Parish of Sleat—Ardvaser, Miss A. McDonald (99); Drumfern, Miss Smith (99); Duisdale, Mr M. Macleod (99); Ferrindonald, Mr J. Christie (99); Kylerhea, Miss M. McKinnon (99); Parish of Small Isles—Eigg, Miss N. Ross (100); Rum, Miss H. O. McCrae (100); Muck, Miss M. A. Campbell (100); Parish of Snizort—Carbost Macdiarmid, Mr J. McIver (99); Kensaleyre, Miss A. Campbell, (99); Parish of South Uist—Balivanich, Miss A. Fyffe (107); Carnan, Miss E. Coulan (107); Eriskay, Mr T. M. Patten (107); Jochdar, Mr Jas. McLaughlin (107); Parish of Stenscholl—Digg, Mr M. A. Mackinnon (99); Staffin, Mr D. J. Macleod (99); Parish of Strath—Breakish, Mr R. J. Stilt (99); Dunan, Mr J. A. MacIntyre (99); Kyleakin, Mr J. D. Gunn (99); Torrin, Miss C. Maclean (99); Parish of Urquhart and Glenmoriston—Bunloit, Miss A. Mackintosh (94); Corrimony, Miss Molly Kane (94); Dalchreichard, Miss M. F. Wilson (94); Glen Urquhart, Mr B. Skinner (94); Invermoriston, Mr W. Grant (94).

COUNTY OF KINCARDINE.

Parish of Arbuthnot—Arbuthnot, Mr A. Mason (74); Parish of Banchory Devenick—Banchory Devenick, Mr R. H. Dean (74); Portlethen, Mr J. R. Hunter (74); Parish of Banchory Ternan—Central, Mr R. H. Paton (79); Crathes, Mr T. Menzies (79); Inchmarlo, Mr W. Gilmour (79); Tilquhillie, Miss A. Morrison (79); Raemoir, Mrs Hadden (79); Parish of Benholm—Benholm, Mr J. Russell (72); Johnshaven, Mr R. Stewart (72); Parish of Bervie—Bervie, Mr T. Mitchell (72); Gourdon, Mr A. Urquhart (72); Gordons, Female, Mrs M. Stewart (72); Parish of Dunnottar—Brackmuirhill, Mr A. Inglis (74); Dunnottar, Mr F. Reid (74); Stonehaven, Epis., Miss L. Rettie (74); Parish of Durris—Crossroads, Mr A. Macdonald (79); Parish of Fettercairn—Fettercairn, Mrs D. J. Young (73); Inch, Mr A. Moodie (73); Fasque, Miss Munro (73); Parish of Fetteresso and Rickarton—Cairnhill, Mr J. Geddes (74); Cookney,

Mr C. Innes (74); Muchalls, Miss C. Watson (74); Netherley, Miss Willox (74); Rickarton, Mr J. Faulds (74); Stonehaven, ? (74); Tewel Joint, Miss A. N. Wood (74); Parish of Fordoun—Fordoun, Mr J. G. Wallace (75); Landsend, Mr D. A. Duncan (75); Tipperty, Miss Duncan (75); Parish of Garvock—Garvock, Mr J. Bethune (72); Parish of Glenbervie—Glenbervie, Mr G. H. Kinnear (75); Parish of Kinneff and Catterline—Kinneff, Mr D. G. Dorward (74); Catterline, Miss Cruickshank (74); Parish of Laurencekirk—Laurencekirk, Mr J. Grant (73); Laurencekirk Episcopal, ? (73); Parish of Maryculter—East, Mrs Paton (74); West, Mr W. R. Bain (74); Parish of Marykirk—Marykirk, Mr J. B. Fenton (73); Napier Memorial, Miss M. T. Hampton (73); Parish of Nigg—Cove, Mr A. J. Barclay (74); Kirkhill, Mr G. Tough (74); Parish of St Cyrus—St Cyrus, Mr W. Russell (73); Parish of Strachan—Strachan, Mr J. F. Mackie (79).

COUNTY OF KINROSS.

Parish of Cleish—Cleish, Mr T. Dobbie (57); Parish of Fossoway and Tulliebole—Carnbo, Mr S. T. Lear (57); Fossoway, Mr W. D. Robieson (57); Parish of Kinross—Kinross, Mr J. M. Ross (57); Parish of Orwell—Orwell, Mr A. Duff (57); Milnathort, Reid Memorial, Mr E. Mann (57); Parish of Portmoak—Portmoak, Mr A. Mitchell (57).

COUNTY OF KIRKCUDBRIGHT.

Parish of Anworth—Fleetside, Mr D. Clark (34); Skyreburn, Mr J. Pritchard (34); Parish of Balmaclellan—Endowed Free, Mr J. Mitchell (34); Ironmaccannie, Mr A. M. Murray (34); Monybuie, Miss M. Fleming (34); Parish of Balmaghie—Glenlochar, Mr D. R. Cunningham (34); Laurieston, Mr A. Hitchcock (34); Parish of Bargrennan—Bargrennan, Mr D. K. Barne (34); Knowe, Mr John Lochs (34); Parish of Borgue—Borgue, Mr J. McF. Doig (34); Parish of Buittle—High, Mr Hugh Knox (34); Palnackie, Mr S. McKie (34); Parish of Carsphairn—Carsphairn, Mr J. Wilson (36); Parish of Colvend and Southwick—Barnbarrock, Mr G. Bentham (34); Colvend, Mr James Davidson (34); Southwick, Mr J. C. Ferguson (34); Parish of Corsock—Corsock, Mr Jas. Weir (34); Parish of Crossmichael—Crossmichael, Mr John Clark (34); Parish of Dalry—Corseglass, Miss R. Campbell (36); Dalry, Mr J. Marchbank (36); Stroanfreggan, Mr J. Leny (36); Parish of Girthon—Girthon, Mr Wm. Learmonth (34); Parish of Irongray—Roughtree, Mr M. A. Henderson (36); Parish of Kells—Dee, Miss Smith (34); Kells, Mr James Anderson (34); Mossdale, Mr W. Douglas (34); Pollharrow, Mr Callander (34); Parish of Kelton—Castle Douglas, Mr H. A. Braine (34); Gelston, Mr S. McMurray (34); Rhonehouse, Mr R. Harris (34); Parish of Kirkbean—Kirkbean, Mr W. D. Douglas (34); Preston, Mr W. A. Forsyth (34); Parish of Kirkcudbright—Johnston, Mr J. M. Smith (34); Townhead, Mr A. Matheson (34); Whinnie Liggate, Mr A. McKinney (34); Old Church, Miss Naismith (34); Parish of Kirkgunzeon—Kirkgunzeon, Mr R. Milligan (34); Parish of Kirkmabreck—Kirkmabreck, Mr C. S. Robertson (34); Creetown, St Joseph's R. C., Miss Doran (34); Parish of Kirkpatrick Durham—Kirkpatrick Durham, Mr R. McConachie (34); Parish of Lochrutton—Lochrutton, Mr A. Dick (36); Parish of Minnigaff—Cree Bridge, Mr G. C. Cowburn (33); Parish of New Abbey—Lochend, Mr J. Herries (34); New Abbey, Mr E. McCarrack (34); Parish of Parton—Parton, Mr Jas. Bell (34); Parish of Rerrick—Auchencairn, Mr Geo. A. Mills (34); Dundrennan, Mr J. Scott (34); Parish of Terregles—Terregles, Miss N. A. Black (36); Parish of Tongland—Tongland, Mr Geo. Hunter (34); Parish of Troqueer—Drumsleet, Mr J. Symington (36); Laurieknowe, Mr J. S. Elder (36); Whinnyhill, Miss R. W. McKie (36); Parish of Twynholm—Twynholm, Mr D. G. Taylor (34); Parish of Urr—Dalbeattie, Mr A. Baxter (34); Hardgate, Mr R. Aird (34); Milton, Miss A. J. Robson (34); Springholm, Miss M. McDougall (34); Dalbeattie, R. C., Mrs Hadfield (34).

COUNTY OF LANARK.

Parish of Airdrie (Burgh)—Academy, Mr H. Manners (9); Albert, Mr J. C. Carlisle (9); Chapelside, Mr J. Moffat (9); Rochsolloch, Mr D. M. Simpson (9); Victoria, ? (9); St Margaret's, R. C., Mr J. McGovern (9); Parish of Avondale—Ballgreen, Mr A. Fleming (1); Barnock, Mrs Ramsay (1); Crosshill, Mr J. Millar (1); St Patrick's, R. C., Miss C. Martens (1); Parish of Biggar—High School, Biggar, Mr J. Young (1); Parish of Blantyre—High, Mr D. Dunlop (15); Low, Mr J. Mess (15); Auchinraith, Mr J. Welsh (15); Parish of Bothwell—Bellshill, Mr A. J. Noble (7); Bellshill Academy, Mr J. Donaldson (7); Bothwell, Mr J. M. Crowe (7); Carfin, Mr Thomas Law (7); Carnbroe, Mr J. MacDonald (7); Chapelhall, Mr T. Dymock (7); Hamilton Palace Colliery, Mr G. S. McCallum (7); Mossend, Mr W. R. Archibald (7); New Stevenston, Mr J. Patrick (7); Mossend, R. C., Miss M. Myles (7); Parish of Cadder—Auchinloch, Mr L. Boyd (12); Bishopbriggs, Mr H. Anderson (12); Cadder, Mr T. H. Collier (12); Gartcosh, Mr W. Findlay (12); Lochfauld, Miss M. Smith (12); Stepps Road, Mr A. H. Hunter (12); Parish of Calderhead—Allanton, Mr P. Lorne (8); Calderhead, Mr Heard (8); Dykehead, Mr J. C. Miller (8); Shotts, St Patrick's, R. C., Mr J. B. Daniel (8); Parish of Cambuslang—Hallside, Mr A. Brown (15); Kirkhill, Mr R. Templeton (15); Newton, Mr A. Stevenson (15); Parish of Cambusnethan—Berryhill, Mr R. Dey (4); Cambusnethan, Mr A. Lawrie (4); Overtown, Miss J. Robertson (4); Waterloo, Mr G. R. Dick (4); Wishaw, Mr J. Ingram (4); Newmains, Mr R. Hunter (4); Parish of Carluke—Braidwood, Mr J. Miller (3); Carluke, G. and I., Miss Shollbred (3); Kilncadzow, Mr R. Findlater (3); Market Place, H. G., Mr J. K. Barr (3); Yieldshields, Mr A. Miller (3); Parish of Carmichael—Carmichael, Mr J. Aitken (1); Parish of Carmunnock—Carmunnock, Mr Alexander Rankin (14); Parish of Carnwath—Auchengray, Mr J. M. Cooke (2); Braehead, Mr W. Messer (2); Carnwath, Mr G. C. Murray (2); Forth, Mr M. Yates (2); Haywood, Mr A. McIntosh (2); New Bigging, Miss J. Dunlop (2); Wilsontown, Mr F. P. Wellwood (2); Parish of Carstairs—Carstairs, Mr S. J. Somerville (2); Caledonian Railway Company's, Mr W. A. Russell (2); Parish of Clarkston—Airdriehill, Mr J. McLuckie (9); Drumbreck, Mr J. Millar (9); Longrigg, Mr D. S. Masterton (9); Longriggend, Miss Grant (9); Parish of Covington and Thankerton—Covington, Mr G. Dickson (1); Parish of Crawford—Crawford, Mr J. Murray (1); Daer and Powtrail, Miss C. Dunlop (1); Summit, Mr G. Haddow (1); Parish of Crawfordjohn—Crawfordjohn, Mr J. H. Henderson (1); Whitecleuch, Mr A. Porteous (1); Parish of Culter—Culter, Mr J. Walker (1); Parish of Dalziel—Craigneuk, Mr G. T. Brough (6); Dalziel, Mr W. Fordyce (6); Hamilton Street, Mr D. F. Macmillan (6); High, Mr D. Greig (6); Merry Street, Mr A. Macdonald (6); Milton Street, Mr J. Stalker (6); Muir Street, Mr J. Graham (6); Craigneuk, R. C., ? (6); Motherwell, R. C., Mr G. Bennett (6); Parish of Dolphinton—Dolphinton, Mr C. McKenzie (2); Parish of Douglas—Douglas, Mr C. C. Riach (1); Stablestone, Mr D. McKay (1); Parish of Douglas Water—Douglas Water, Mr E. Waddell (1); Parish of Dunsyre—Dunsyre, Mr J. Miller (2); Parish of East Kilbride—Auldhouse, Mr J. Auld (3); East Kilbride, Mr J. T. Thom (3); Jackton, Mrs J. G. Eaglesome (3); Maxwellton, Mr W. Russell (3); Parish of Glassford—Chapelton, Mr G. Shearer (3); Glassford, Mr T. Laug (3); Parish of Glasgow (Burgh)—Abbotsford, Mr T. C. Anderson (13); Adelphi Terrace, Mr F. W. Grant (13); Alexander's, Mr W. Jamieson (13); Alexandra Parade, Mr John Clanachan (13); Anderston, Mr P. McD. Andrew (13); Annfield, Mr Andrew Hoy (13); Barrowfield, Mr D. Gilchrist (13); Bishop Street, Mr Adam Miller (13); Calton, Mr W. A. Davidson (13); Camlachie, Miss J. Morrison (13); Camden Street, Mr W. Fleming (13); Campbellfield, Mr W. Scott (13); Crookston Street, Mr A. Miller (13); Dalmarnock, Mr W. McIntyre (13); Dennistown, Mr J. Gibson (13); Dobbies Loan, Mr H. Muir (13); Dove Hill, Mr Robert Crawford (13); Dunard Street, Mr J. Wood (13); Finnieston, Mr J. Knox (13); Elmvale, Mr J. Buist (13); Freeland, Mr T. Smith (13); Garnetbank, Mr W. W. Russell (13); Gorbals, Mr Robert Edgar (13); Greenside Street, Mr R. Reid (13); Grove Street, Mr F. Connor (13); Henderson Street, Mr John Middleton (13); Hozier Street, Mr Hugh Cameron (13); Kay, Mr W. S. Jamieson (13);

Kelvinhaugh, Mr W. Lee (13); Kent Road, Mr R. J. Wilson (13); Kent Road H. G., ? (13); Keppochhill, Mr W. Young (13); Martyrs', Mr W. M. Cullen (13); Napiers Hall, Mr J. B. Freebairn (13); Oakbank, Mr J. Whyte (13); Oatlands, Mr J. A. J. Watt (13); Overnewton, Mr David Picken (13); Petershill, Mr John T. Smith (13); Provanside, Mr W. Marshall (13); Queen Mary Street, Mr John Robertson (13); Rose Street, Mr A. L. Smith (13); Rumford Street, Mr John Hay (13); St David's, Mr Hector Dove (13); St George's Road, Mr W. A. Thompson (13); St James', Dr Knight (13); St Rollox, ? (13); Shield's Road, Mr H. McCallum (13); Sir John N. Cuthbertson's, Mr C. S. Ogilvie (13); Springbank, Mr R. Gilfillan (13); Springburn, Mr Jos. Routledge (13); Springfield, Mr J. Brown (13); Townhead, Mr Thos. Lindsay (13); Washington Street, Mr J. Glen (13); Well Park, Mr G. Stewart (13); Willowbank, Mr R. Edgar (13); Wolseley Street, Mr J. D. Robertson (13); Buchanan Institution, Mr A. McLaren (13); Normal Practising, Mr J. Beveridge (13); Our Lady and St Francis, R. C., ? (13); St Joseph's, R. C., Mr W. Lornax (13); St Mary's Epis., Mr G. Harrison (13); Parish of Govan—Bellahouston Academy, Mr D. McGillivray (13); Broomloan Road, Mr J. A. McIntosh (13); Dowanhill, ? (13); Fairfield, Mr B. Hutchison (13); Govanhill, ? (13); Greenfield, Mr A. McLeod (13); Harmony Row, Mr Joseph Scott (13); Kinning Park, Mr T. Brodie (13); Partick, Church Street, Mr Purdie (13); Partick, Hamilton Crescent H. G., Mr S. Fraser (13); Partick, Rosevale Street, Mr D. Taylor (13); Partick, Stewartville, Mr J. Main (13); Partick, Thornwood, Mr W. C. Lindsay (13); Pollokshields, Albert Road, Mr G. S. Brown (13); Polmadie, Mr W. Drummond (13); Rutland Crescent, ? (13); Whiteinch, Mr W. Greenhorn (13); St Saviour's, R. C., Mr T. O'Connor (13); Parish of Hamilton (Burgh)—Academy, Mr D. MacLeod (5); Elementary, Miss Baird (5); Beckford Street, Mr M. Blair (5); Bent Road, Mr W. Hamilton (5); Townhead, Mr J. McCabe (5); St John's Grammar, Mr J. Hendrie (5); Parish of Hamilton (Landward)—Beechfield, Miss Smith (5); Ferniegair, Mr J. Dunn (5); Glenlee, Mr R. Steele (5); Greenfield, Mr J. Blyth (5); Low Waters, Mr R. Muir (5); Quarter, Miss Marshall (5); Cadzow, Mr P. McGall (5); Parish of Lanark (Burgh)—Burgh, Mr A. Johnstone (2); Grammar, Mr H. Henderson (2); Parish of Lanark (Landward)—Nemphlar, Miss J. Millar (2); New Lanark, Mr J. McLatchie (2); Smyllum, R. C., Sisters of Charity (2); Smyllum Blind and Deaf Mutes, Sisters of Charity (2); Parish of Larkhall—Academy, Mr C. W. Thomson (3); Duke Street, Mr James Frame (3); Glengowan, Mr J. Paterson (3); Muir Street, Mr J. A. Beattie (3); Parish of Lesmahagow—Auchinheath, Mr J. L. Tait (1); Bellfield, Mr J. Weir (1); Blackwood, Mr William Martin (1); Kirkfield Bank, Mr J. Dunlop (1); Lesmahagow Senior, Mr M. Glover (1); Lesmahagow Junior, Miss Grierson (1); Waterside, Mr R. Gibson (1); Parish of Libberton—Libberton, Mr W. B. Smellie (2); Parish of Maryhill—Gairbraid, Mr J. Simpson (13); North Kelvinside, Mr D. M. Cowan (13); East Park, Mr Ross (13); Possil Park, ? (13); Parish of New Monkland—Avonhead, ? (10); Gain, Mr J. Kiddie (10); Greengairs, Mr J. Arthur (10); New Monkland, Mr T. Philip (10); Riggend, Mr J. Roger (10); Roughrigg, Mr J. Gorman (10); Parish of Old Monkland—Baillieston, Mr R. Hunter (11); Blairhill, Mr J. Pickin (11); Calderbank, Mr J. Russell (11); Coatbridge H. G., Mr W. Service (11); Coatbridge, Langloan, Mr H. B. Sergeant (11); Mount Vernon, Mr R. Young (11); Old Monkland, Mr J. Laurence (11); West Maryston, Mr J. Gibson (11); Whifflet, Mr Charles B. Noble (11); Coatbridge St Patrick's, R. C., Mr J. Bonner (11); Whifflet, R. C., Mr J. Casey (11); Parish of Pettinain—Pettinain, Mr E. Anderson (2); Parish of Rutherglen (Burgh and Landward)—Burgh, Mr Henry C. Jack (14); Eastfield, Mr W. Forsyth (14); Farie Street, Mr J. F. Scott (14); MacDonald's, Mr George Kerr (14); Parish of Shettleston—Millerston, Mr W. Thomson (11); Shettleston, Mr McHaffie (11); Tollcross, Mr J. Mair (11); Parish of Shotts—Northrigg, Miss S. McLeod (8); Shotts, Mr A. Paterson (8); Parish of Springburn—Wellfield, Mr J. Brown (12); Parish of Stonehouse—Greenside, Infant, Miss E. Black (3); Sandford, Miss Sutherland (3); Townhead, Mr A. McIntosh (3); Parish of Wandell and Lamington—Lamington, Mr D. S. Melville (1); Lamington, Female and Infant, Miss H. H. Allan (1); Parish of Wiston and Roberton—Roberton, Mr J. Waddell (1).

COUNTY OF LINLITHGOW.

Parish of Abercorn—Abercorn, Mr A. Hardie (48); Abercorn, Girls, Miss M. Wilson (48); Parish of Bathgate (Town)—Bathgate, Mr J. H. Wheclaw (49); Bathgate Academy, Mr H. Dunn (49); Parish of Bathgate (Landward)—Starlaw, Miss Wardrop (49); Parish of Bo'ness and Carriden—Bo'ness, Mr J. Dunlop (48); Bo'ness Anderson Academy, Mr W. Gladstone (48); Bo'ness, Infant, Miss A. Brown (48); Borrowstown, Mr Jas. Boyd (48); Carriden, Mr Wm. Andrew (48); Grangepans, Mr E. Nelson (48); Kinneil, Mr J. Hunter (48); Blackness, Miss B. Morrison (48); Bo'ness St Mary's, R. C., ? (48); Parish of Dalmeny—Dalmeny, Mr J. W. Sinton (48); Parish of Ecclesmachan—Craigbinning, Mr J. B. Inglis (48); Parish of Kirkliston—Kirkliston, Mr Jas. Brown (48); Newhouses, Miss M'Knight (48); Winchburgh, Mr W. Fowler (48); Parish of Linlithgow—Linlithgow Academy, Mr J. Beveridge (48); Linlithgow, Mr Jas. Forbes (48); Parish of Livingstone—Blackburn, Mr W. Stewart (48); Livingstone, Mr J. Robertson (48); Seafield, Mr M. Gray (48); Parish of Torphichen—Blackridge, Mr R. M. Brown (49); Torphichen, Mr Menzies (49); Parish of Uphall—Broxburn, Mr J. P. Cleghorn (48); Uphall, Mr J. S. Calder (48); Hatton, Infant, Miss Kinnear (48); Parish of Whitburn—East Benhar, Mr R. Macdonald (49); Longridge, Mr T. Sutherland (49); Stoneyburn, Mr J. Steele (49); Whitburn, Mr W. Thomson (49).

COUNTY OF NAIRN.

Parish of Ardclach—Campbell's, Mr D. Fraser (90); Fornighty, Miss E. D. Hall (90); Parish of Auldearn—Auldearn, Mr T. H. Rutherford (89); Moyness, Miss E. J. Garden (89); Parish of Cawdor—Barivan, Miss A. Aird (89); Cawdor, Mrs A. Allen (89); Clunas, Miss Barbour (89); Burgh of Nairn—Monitory, Mr R. Jamieson (89); Parish of Nairn (Landward)—Delnies, Miss J. Penny (89); Geddes, Mr J. Aird (89).

COUNTY OF ORKNEY.

Parish of Cross and Burness—Burness, Mr J. M. Gunn (109); Cross, Miss M. J. Stout (109); North Ronaldshay, Mr C. B. Robertson (109); Parish of Eday—South, Mr J. Carrell (109); Parish of Evie and Rendall—Gairsay, Miss J. D. M'Ewan (109); Rendall, Mr W. Wylie (109); Parish of Firth and Stennis—Firth, Mr W. Mackay (109); Stennis, Mr F. S. Scott (109); Parish of Harray and Birsay—Birsay, Mr Geo. S. Duthie (109); Harray, Mr P. M'Cullie (109); Hundland, Mrs Maxullie (109); Parish of Holm—East, Miss E. Sheridan (109); West, Mr J. Inkster (109); Parish of Hoy and Graemsay—Graemsay, Mrs M. S. Campbell (109); Hoy, Mr Rendall, (109); Rackwick, Miss M. T. Moat (109); Burgh of Kirkwall—Kirkwall, Mr J. M'Ewen (109); Parish of Kirkwall (Landward) and St Ola—Scalpa, Miss J. S. Scott (109); Parish of Lady—Lady, Central, Mr J. Gariock (109); Sellibister, Mr R. Clelland (109); Parish of Orphir—Kirbister, Mr J. Omond (109); Orphir, Mr P. L. Muir (109); Parish of Rousay and Egilshay—Egilshay, Mr W. M. Glen (109); Frotoft, Miss B. Norquay (109); Sourin, Miss J. Marwick (109); Veira, Miss M'Kenzie (109); Wasbister, Miss M. W. Wards (109); Parish of St Andrews and Deerness—Deerness, Mr M. Spence (109); Tonkerness, Mr S. Thompson (109); Parish of Sandwick—North, Mr J. S. Robertson (109); Yesnaby, Miss M. Spence (109); Parish of Shapinsay—Shapinsay, Mr J. Craigie (109); do. North, Miss J. R. Hamilton (109); Parish of South Ronaldshay and Burray—Burray, Mr A. M'Callum (109); Hope, Mr G. Barclay (109); Tomisons, Mr Cruickshank (109); Widewall, Mr D. M'Cormack (109); Parish of Stromness—Kirbuster, Mr H. R. T. Miller (109); Stromness, Mr D. Hepburn (109); Parish of Stronsay—Central, Mr R. T. Annand (109); North, Female and Infant, Mrs M. L. Tolmie (109); South, Fem., Miss M. Calder (109); Parish of Walls and Flotta—Brims, Miss M. C. Johnston (109); Flotta, Mr A. Forbes (109); North Walls, Miss J. Sinclair (109); South Walls, Mr J. A. Davidson (109); Parish of Westray and Papa Westray—East Side (Skelwick), Miss J. M. Shurie (109); Papa Westray, Miss M'Conachie (109); Pierowall, Mr J. S. Sutherland (109); West Side (Midbea), H. Stevenson (109).

COUNTY OF SHETLAND.

Parish of Bressay—Bressay, Mr W. G. A. Morgan (110); Parish of Delting—Brae, Mr J. H. Moodie (110); Gonfirth, Miss A. C. M'Pherson (110); Mid Lee, Mr T. Hanton (110); Olnafirth, Mr D. Fraser (110); Roe, Mr A. Falconer (110); Parish of Dunrossness—Boddam, Miss Morrison (110); Fairisle, Mr D. M'Lean (110); Quendale, Mr M. R. Johnstone (110); Virkie, Mr H. H. Gear (110); Parish of Fetlar—Fetlar, Mr B. Alexander (110); Parish of Lerwick—Gulberwick, Miss I. Innes (110); Lerwick, Central, Mr W. M. Wightman (110); Anderson Educational Institute, Miss Morrison (110); Quarff, Miss M. J. Henderson (110); Parish of Nesting, Lunnasting, Whalsay and Skerries—Laxfirth, Miss C. Hutchison (110); Lunnasting, Mr A. G. M'Michen (110); Whalsay (Borough), Mr H. White (110); Skerries, Mr Geo. Mackay (110); Parish of Northmavine—Eshaness, Miss E. M'Nicoll (110); North Roe, Mr R. S. Bremner (110); Sullom, Miss M. Calderwood (110); Urafirth, Miss J. Nicolson (110); Parish of Sandsting and Aithsting—Gruting, Mr J. S. Peterson (110); Skeld, Mr H. Mackay (110); West Burrafirth, Mr H. Arthur (110); Parish of Tingwall, Whiteness and Weisdale—Girlsta, Miss J. A. Jamieson (110); Scalloway, Mr W. Robertson (110); Trondra, Miss L. Inkster (110); Weisdale, Mr E. M. Henderson (110); Parish of Unst—Baltasound, Mr D. J. Henderson (110); Haroldswick, Miss M. A. Stephen (110); Uyasound, Miss M. A. Harrison (110); Westing, Mr J. Gifford (110); Parish of Walls, Sandness, Papa and Foula—Dale, Mr J. D. Robertson (110); Foula, Mr P. Henderson (110); Happyhansel, Mr J. Dalziel (110); Parish of Yell—Burravoe, Mr H. Robb (110); Gutcher, Mrs Hoseason (110); Ulsta, Miss M. A. Esson (110); West Yell, Mr J. H. Smith (110).

COUNTY OF PEEBLES.

Parish of Drumelzier—Drumelzier, Mr W. T. C. M'Intosh (41); Parish of Innerleithen—Innerleithen, Mr T. Weir (41); Leithenhope, Miss Smith (41); Walkerburn, Mr George Hardie (41); Parish of Kilbucho, Broughton, and Glenholm—Broughton, Central, Mr Hogg (41); Glenholm, Miss Hall (41); Parish of Newlands—Lamancha, Mr W. Kyle (41); Newlands, Mr W. Mackie (41); Parish of Peebles—Peebles, Mr James Tod (41); Halyrude, Miss Murray (41); Parish of Stobo—Stobo, Mr A. Jervies (41); Parish of Traquair—Traquair, Mr A. Menzies (41); Kirkburn, Miss M. T. Fraser (41); The Glen, Miss Dewar (41); Parish of Tweedsmuir—Tweedsmuir, Mr J. Yellowlees (41); Parish of West Linton—West Linton, Mr J. Halley (41); West Linton Episcopal, Miss Lyrie (41).

COUNTY OF PERTH.

Parish of Abernethy—Abernethy, Mr A. Davidson (58); Parish of Abernyte—Abernyte, Mr J. F. Falconer (68); Parish of Alyth—Alyth, Mr D. B. Lawson (70); Gauldswell, Miss E. Fraser (70); Parish of Amulree—Amulree, Mr M. Black (71); Shian, Miss Cameron (71); Parish of Ardoch—Braco, Mr T. B. MacOwan (59); Parish of Arngask—Arngask, Mr J. Wilson (58); Parish of Auchterarder—Aberuthven, Mr J. M'Math (58); Auchterarder, Mr D. Arkley (58); Parish of Auchtergaven—Auchtergaven, Mr D. Munro (71); Stanley, Mr J. Cameron (71); Parish of Balquhidder—Balquhidder, Mr William Beattie (59); Lochearnhead, Mr D. M'Donald (59); Strathyre, Mrs M'Gechan (59); Parish of Blackford—Blackford, Mr W. M'Farlane (59); Gleneagles, Mr R. Guthrie (59); Tullibardine, Mr L. A. Tovani (59); Parish of Blair Atholl—Blair Atholl, Mr A. Kellock (76); Glenerichty, Miss M. C. Macdonald (76); Pittagowan, Miss A. Reid (76); Strathtummel, Miss M. Livingstone (76); Parish of Blairgowrie—Blairgowrie, Mr R. Robb (70); Parish of Blairingone—Blairingone, Mr A. R. Morrice (51); Parish of Callander—Callander, Mr R. Fulton (59); Parish of Caputh—Spittalfield, Mr M'Murtrie (71); Wester Caputh, Miss J. F. Smith (71); Meikleour, Mr G. F. Tennant (71); Parish of Cargill—Burreltown,

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COUNTY OF SELKIRK.

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